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VARIOUS REPUBLIC OFFICIALS DISCUSS ECONOMIC DEVELOPMENT

Improving Quality Control in Uzbekistan

Tashkent PRAVDA VOSTOKA in Russian 7 Sep 79 p 2

[Text] Efficiency and quality are two interrelated categories. The economic effect of improvement of product quality can thus be equated with the growth of production volume. A high level of quality means savings of labor and material resources, growth of export possibilities and fuller satisfaction of the needs of society. Technical progress, the chief factor in growth of efficiency and intensification of production, is accelerating. Moreover, this progress is two-sided, since, on the one hand, the achievements of science and technology serve as the basis for raising the technical level of products, while, on the other, they have an effect on the quality of manufactured machinery and equipment and on raw and other materials.

During this five-year plan, major measures are being implemented aimed at raising the technical level and quality of manufactured products. The successful fulfillment of this task is being helped by the introduction of a complex system of product quality control at the republic's industrial plants. State certification of product quality has been further developed; approximately 200 programs of complex standardization and metrological provision have been developed; there have been introduced planning of commodity output according to categories of quality and stimulation of production of products of high quality; a unified system of technological preparation of production is being introduced; a program of unification of products of machine building and instrument making is being carried out; state reporting on quality has been introduced; the system of state supervision of standards and measuring techniques is being perfected.

The initiative and creative search of leading collectives have made it possible to devise new forms and methods of improving product quality; among them, wide prevalence is now being enjoyed by the Saratov system of defect-free manufacture of products and turning them over on first presentation, by a system of defect-free labor and, finally, by a complex system of product quality control developed in leading enterprises of L'vovskaya Oblast. As we know, the experience of the L'vov workers was approved by the CPSU Central Committee and recommended for broad adoption.

Significant results are being achieved in the struggle for raising product quality by the workers of the republic. Thus the developmental rate of industrial production has now grown 1.5-fold; each year 40-70 percent of consumer goods are renewed in light industry. Last year republic enterprises put out products with the Seal of Quality in the amount of 903 million rubles, which is almost threefold the amount in 1975. This is an achievement of the workers of our industry, especially the collectives of such enterprises as Chirchik Transformer Plant, Namangan Chemical Plant, Andizhan Elektrovigatel' Plant, Tashkentkabel' and Tashelektromash plants and others, more than half of whose products are being produced in the highest category of quality. One-third of products with the Seal of Quality is being produced by the Tashkent Krasnaya Zarya Sewing Association, Urtak Confectionery Factory, Yangiyul' Lazzat Confectionery-Yeast Association and several other enterprises.

Today 1,909 items are being produced in the republic with the Seal of Quality, and 7.5 percent of the total volume of products produced bear the Seal of Quality.

It is planned this year to have the proportion of products with the Seal of Quality reach 14.4 percent. But up to this time the condition of things does not fully correspond to this requirement. Thus, in the second quarter the relative share of products with the Seal of Quality amounted to only 11.2 percent for the Ministry of Light Industry, 6.9 percent for the Ministry of Food Industry, 11.2 percent for the Ministry of Construction Materials Industry of the republic and so on. The heads of ministries and departments should take decisive steps to eliminate the lag and ensure the fulfillment of targets for output of products with the Seal of Quality.

Significant progress in raising quality has also taken place in other sectors of the national economy. In construction, for example, new series of dwelling houses and cultural and everyday-service buildings have been developed and adopted, improving the appearance of our cities and villages. Particularly noticeable are the successes achieved by the builders of Tashkent, Chirchik, Samarkand, Almalyk and Tashkentskaya and Ferganskaya oblasts.

Enterprises and associations of the republic have progressed from separate isolated measures to increasing development of comprehensive plans for raising quality and quality control of products. And now more than one hundred of them have introduced a comprehensive system of product quality control. The initiators in this are the collectives of Tashkent Aircraft Production Association imeni V.P. Chkalov, the Tire Production Association imeni 50-Letiye Uzbekskoy SSR and the Communist Party of Uzbekistan, the Tashsel'mash and Uzbeksel'mash plants, Urtak Confectionery Factory, the Tashkent Factory of Art Products, as well as Krasnaya and Sredazelektroappart associations whose work has been approved by the Central Committee of the Communist Party of Uzbekistan. Economic gains resulting from the introduction of quality control amount to more than 10 million rubles.

At the same time, serious defects exist in the introduction of the complex system of product quality control. This work is proceeding slowly at enterprises of the ministries of Procurement, Agriculture, Construction Materials Industry, Cotton Cleaning Industry and Motor Transport.

In the republic, inadequate use is being made of the big possibilities of the complex system for improving product quality. Thus, the relative share of products with the Seal of Quality in the total volume of industrial production is almost half of the all-union level in our country, and only 247 enterprises put out such products. In particular, an insignificant relative share of products of the highest category of quality is to be found in Khorezmskaya, Kashkadar'inskaya and Surkhandar'inskaya oblasts and Karakalpakskaya ASSR.

Unfortunately, there are still those enterprises that continue to put out products of the second category of quality. The quality level of many types of products does not conform to modern requirements. Last year almost two-thirds of the 934 checked enterprises belonging to machine building, light, food and local industry, construction materials industry and a number of other sectors put out products deviating from the requirements of state standards and technical conditions. Some enterprises put out substandard products.

The problem of quality still remains acute and it will be necessary to work a great deal with determination to sharply improve this. In order to fulfill the targets of the five-year plan, it is necessary to ensure at each enterprise product output that is in strict conformity to planned quality level.

Common to all sectors are the problems of improving organizational work in the transition to product quality control, perfecting planning, standardization and metrology, speeding up certification of products, raising the technical level of production and technological discipline and bolstering the role of moral and material incentives and development of the creative activity of workers and specialists in the struggle for high quality of manufactured products and for the honor of the plant brand.

In the struggle for improvement of quality, a leading role is being played by current and long-range planning of quality. At the same time, defects are to be found in planning. Thus, in plans of social-economic development of the republic, no section exists dealing with the introduction of systems of quality control for ministries and departments, Karakalpakskaya ASSR and oblasts or with the introduction of sectorial control systems. Many ministries provide reduced annual plans for increase of products with the Seal of Quality. Targets are not being fulfilled for certification of products and standardization.

Many defects are also to be found in standardization and revision of obsolete normative technical documentation. Last year, for example, 72 enterprises of the republic failed to introduce 79 standards and continued to put out products that do not conform to modern requirements. The duty of heads of ministries and departments, associations and enterprises of the republic is to ensure strict control over timely introduction of standards in production and to raise their scientific-technical level.

It is, however, possible to have new equipment, and progressive technology, and modern standards, and first-class measuring equipment and still not achieve high product quality if you have untrained workers and specialists, if you do not have an organized improvement of cadre qualifications, if you do not have an atmosphere motivating every worker to a creative search and conscientious labor.

The problem is to develop at each enterprise and at associations and ministries an efficient program of universal education on problems of quality, including instruction in the theory of quality control, forms and methods of organizing this control and introducing systems. The struggle for quality improvement should be conducted at all stages and at all levels--from the work place to the ministry, department and Gosplan of the republic.

Work should also be organized on introducing sectorial systems of quality control. The need now exists for creating rayon, city, oblast and territorial systems of quality control so that they can be introduced in the next two-three years.

In order to ensure stability in product quality, it is necessary to increase the role of supply organizations of the republic's Gosstab. The struggle for quality requires increasing the responsibility not only of collectives putting out end products but also all parts of supply and sales.

In the system of quality control, the role of trade organizations is great. The trade sphere must exert a strong influence on the quality of manufactured goods, especially on ensuring the appearance of goods and a good state of preservation of products. It has to motivate industry to put an end to the output of goods that are not popular and to provide information for it on the structure of demand. But so far the influence of trade on improving the quality of consumer goods and expanding their assortment is hardly being felt.

A firm position must be taken by control organs: the Uzbek Republic Administration of Gosstandart, quality inspection, departmental control services and others. Right now all of them work in an uncoordinated fashion without a unified coordination plan, which reduces effectiveness of control and the quality of checks. The Uzbek Republic Administration of Gosstandart and its territorial organs must increase still more methodological assistance to ministries, departments, enterprises and organizations in the development and introduction of a comprehensive system of product quality control, direct the activities of standardization and metrological services, coordinate the efforts of all organs in the republic controlling product quality.

Ministries, departments, enterprises and organizations must in their turn speed up the development and introduction of a comprehensive system. So far an insufficient contribution to improving quality control has been made by the Uzbek SSR State Committee for Labor, the Uzbek SSR State Committee for Prices and other intersectorial organs.

But the basic field of activity in the struggle for quality still is the shop, section and plant, where material wealth is created; consequently the chief efforts should be directed toward enhancing the role of labor collectives and toward increasing their labor and creative activity.

The organization of socialist competition for increasing output of high-quality products and for work without lagers should be raised to a new level. Obkoms, gorkoms and raykoms of the party, soviet, trade-union and komsonol organs must analyze more deeply the work of operational organizations and more actively direct their efforts toward the solution of basic problems of quality, as well as use more fully accumulated experience.

The relative share of products with the state Seal of Quality by the end of the five-year plan should grow to 20 percent of the total volume of production. This year alone it is planned to certify no less than 360 products with the Seal of Quality. But these figures have to be significantly exceeded and the efforts of enterprises and associations, ministries and departments and party organs of the republic will have to be primarily directed to this end.

Recently, the CPSU Central Committee adopted a decree on further improving the economic mechanism and tasks of party and state organs. The CPSU Central Committee and the USSR Council of Ministers adopted a decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Raising Production Efficiency and Product Quality." These documents comprehensively resolve the urgent problems of management of the economy of developed socialism and demonstrate the irresistible vital force of our planning system. A new system of planning indicators is being introduced at all levels of management. The work of every enterprise will be assessed not on the basis of gross output but on the basis of the concrete contribution of the collective to the growth of net production and fulfillment of consumers' orders.

Industrial workers, like all workers in our republic, are directing their efforts these days at further boosting production efficiency and quality of manufactured products and thereby are making a worthy contribution to the solution of the tasks set by the 25th CPSU Congress and the 19th Congress of the Communist Party of Uzbekistan.

Economic Planning, Management in Estonia

Tallin SOVETSKAYA ESTONIYA in Russian 11 Sep 79 p 2

[Text] As we know, the forms and methods of management and planning of the national economy undergo changes at different stages of the socialist economy and are improved in proportion to the development of productive forces and social processes. This is a natural process; the Communist Party has always attached much importance to having forms and methods of management of the economy and social processes be in agreement with the requirements and tasks of a specific stage of economic and social development and with the requirements of economic policy developed by the party as a most important sphere of struggle for communism. Planning serves as the chief instrument of the economic policy's realization.

Three basic tasks are solved through plans--consistent growth of productive forces, improvement of public relations and establishment of the socialist way of life. As we know, our plans encompass all sides of economic and social development and have for their aim realization of the highest goal of socialist production--fullest satisfaction of the growing material and spiritual requirements of the people.

Many problems arise in the practical work of any development. In the field of our country's economic and social development, the problems are of economic growth on the basis of intensive development of production. This signifies the necessity of raising the technical level of production, making fuller use of the created potential, that is, improving the use of fixed capital and achieving as great a saving as possible in labor and material resources, as well as financial funds. The meaning of raising work efficiency and quality is to be found in this. But at the present stage of development, the rate of growth of production to a large extent is retarded by the level of efficiency of equipment, capital investment and the high material intensiveness of production.

One of the chief provisions of the recent decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Raising Efficiency of Production and Quality of Work" is that of strengthening and improving long-range planning and developing an interconnected system of long-range, five-year and annual plans and converting the five-year plan into the chief form of planning for the national economy as a whole and for each enterprise individually. Thus, the five-year plan is truly becoming the basis of the economic activity of enterprises, associations and ministries. Assessment of the fulfillment of the five-year plan at all levels of management will be done by means of an accumulative total starting with the beginning of the five-year plan and of the annual plan--by means of an accumulative total starting with the beginning of the year.

The indicator system of the plan is being improved for the purpose of motivating in every way possible labor collectives to raise labor productivity on the basis of new equipment and fuller use of fixed capital for all-out economy of all forms of material resources and manpower. This applies in particular to the indicative of normative net production through whose use the contribution of labor collectives is evaluated most objectively. This indicator will be used to determine limits to the number of workers and employees and also for setting targets for reducing employment of manual labor. In capital construction, the role of the indicator of putting into operation fixed capacities and facilities is being bolstered in planning and evaluation of the results of activity and stimulation. Limits of capital investment and construction and installation work will be stably approved for five years; they will not be subject to revision in annual plans. In an article by Deputy Chairman of the USSR Council of Ministers, Chairman of Gosplan SSR Comrade Baybakov published in the newspaper PRAVDA on 22 August of this year, it says: "Establishment of a limit instead volume of capital investment changes the matter significantly. The limit is a resource indicator characterizing

the size of outlays of capital investment for the planned operation of non-completed enterprises, capacities and facilities and the creation of normative reserves. Here the chief criterion is economizing of resources for a fulfilled volume of work."

This position brings up the complex task of working out stable five-year plans of capital investments balanced against resources of materials, equipment, as well as labor and financial resources and the creation of essential reserves.

The task is set of first-priority allocation of capital investment, material and other resources for the modernization and reequipment of existing enterprises on the basis of new technology. At the same time, the construction of new and expansion of existent enterprises is being restricted for the purpose of making fuller use of already built capacities. This significantly increases the responsibility of ministries, departments and planning organs in approval of a list of new construction projects and enterprises scheduled for modernization. Bank credit is the basic form of financing capital investments. In this connection, it is necessary to take into account that each ruble of capital investment must be evaluated not only from the point of view of capacity growth but also from the point of view of its return in raising the technical level of production.

The production and delivery of technical equipment for capital construction will not be restricted to the limits of the annual plan but will provide for the entire period of erecting a facility or a priority complex to the time of it being put in operation.

Questions of boosting the economic effectiveness of public production are largely connected to the rational and economic use of material resources. The question of all-out economy of all forms of fuel-power resources and of ferrous and nonferrous metals is most acute at the present time. There are also certain difficulties in providing the national economy with timber, several kinds of chemical raw materials and so forth. Savings of all kinds of material resources and reduction of the norms of expenditure of raw material per unit of production began from below. For stimulation of these processes and devoting more attention to the use of cheaper materials without deteriorating quality of manufactured products, it is planned that profit size in the establishment of wholesale prices for new products with less materials intensive-ness will be retained.

The heads of associations and enterprises, ministries and departments and also Gosplan USSR have to concentrate their attention on looking for ways of achieving all-out economy of all forms of fuel-power resources and particularly making significant economies of liquid boiler-furnace fuel, as well as economies of ferrous and all types of nonferrous metals. This is an important task from the viewpoint of raising production efficiency and balance of plans.

The improvement of economic factors and stimuli must become an important reserve for raising production efficiency.

At the present time, labor collectives, especially engineering and technical personnel, are required to make a profound study of this most important party and economic document and to put it into effect.

A great deal of work will have to be done in the republic in order to put all the provisions of this decree into practice. At the present time we are greatly tied in to the development of all-union normative acts. This year there will be started the compilation of descriptive documents of enterprises. This is an important task and the specialists of the enterprises should begin as soon as possible in resolving it and particularly in carrying out preparatory work. They will be one of the most important documents for providing a basis for engineering and economic calculations for production.

Much work will have to be done in the transition to new indicators for planning of labor--limits to the numbers of workers and employees, wage norms per ruble of product and targets for reducing the proportion of manual labor. These indicators should promote comprehensive mechanization and automation of production and release of workers engaged in manual labor with their transfer to sectors requiring higher qualifications. Now there should be determined for each enterprise the number of persons engaged in manual labor and its character, and work should be started on the development of proposals for reduction of manual labor for the 11th Five-Year Plan and the determination of a system of upgrading qualifications of released cadres and so on.

Obviously, pertinent experience should be studied both of enterprises in Estonia and of enterprises in other republics; in particular we should become acquainted with the initiative of labor collectives in Zaporozhskaya Oblast where they have worked out systems of organizational-technical measures and economic measures of comprehensive mechanization of labor at enterprises of different sectors. In connection with the difficult labor balance, this is especially important today.

Normative planning of wages increases the relation between remuneration of work and the volume of production and growth of productivity. This expands the independence of enterprises and associations in planning of the wage fund on the basis of wage norms for a ruble of product established in the five-year plan.

The Gosplan ESSR system faces major tasks in connection with the strengthening and further development of contractual relations and progressive forms of guaranteed supply of enterprises and construction organizations. Major importance is to be attached in planning to the development of territorial balances of production and distribution of the most important types of products and to the compilation on their basis of optimal freight traffic volume for mass freight. This is an important and responsible matter and it should be carried out by the republic's Gosplan and Gosplan together with transport agencies. A list of these balances has as yet not been established, but it can be said with a fair degree of certitude that in our republic it will apply to local construction materials, cement, glass, rolled roofing materials, lumber, peat, mineral fertilizers and other types of products produced in Estonia.

The decree sets out measures aimed at increasing the interest of associations (enterprises) in making better use of productive capital and economizing material resources. The heads of associations and enterprises should take into consideration that norms of payment out of funds are set as a rule in the amount of 6 percent, while payment for above-norm and non-credit-extended stocks of physical assets and non-installed equipment is made from profit left at the disposal of associations and enterprises. This means that with fulfillment of plans of production and profit with a lower cost of productive capital (versus the plan) payment savings from these funds remain at the disposal of associations and enterprises and deposits into the budget are reduced by this sum. Enterprises, associations, ministries and departments should in the time remaining this year examine the composition of working capital and take steps to sell not needed raw and other materials, items going into sets, excessive uninstalled equipment, especially imported equipment. In this work Gosstatb ESSR will provide much assistance.

At this time, it is necessary to bring to the attention of all engineering and technical personnel and workers and employees the importance of this most important political and economic document, to deeply investigate the nature of the measures and ably with a knowledge of the task to start on the preparation and in many cases on the achievement of the set objectives. This is also necessary in view of the fact that in the first half of 1980 completion is expected of the development of drafts of five-year plans at enterprises and for the republic as a whole, and the process will begin of coordinating the 11th Five-Year Plan in USSR ministries and departments and at Gosplan SSSR.

It is very important to bring to the cognizance of labor collectives that we do not have a short-lived campaign but major tasks extending over a long period of time. Their successful fulfillment will in significant measure determine the rate of our development and the rise of the well-being of the Soviet people.

Economy Stressed in Georgia

Tbilisi ZARYA VOSTOKA in Russian 28 Sep 79 p 2

[Text] A most important component of the economic strategy of the developed socialist society as defined by the 25th CPSU Congress is the stress on raising production efficiency.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Raising Efficiency of Production and Quality of Work" set the task of ensuring the "rational use of productive capital, material, labor and financial resources and strengthening the regime of economy and eliminating losses in the national economy."

Economy under our conditions is not an economy of need or scarcity. It is an economy of sufficiency under conditions of developed socialism in a

tremendous socialist country which has for its aim undeviating growth of the well-being of the people. Its particular significance at the present stage is determined by a tremendous scale of production and consequently by the scale of possible gain from the rational use of monetary resources.

Much has also been accomplished in this direction in our republic. At the present time it would be difficult to cite any one sector of the economy where labor-intensive processes have not been automated and mechanized. A most important achievement of the present five-year plan is that a scientific-planning and material-technical base has been created for the continued introduction of automated control systems. In particular, there have been formed in the republic planning-and-design and scientific-research institutes, special design bureaus, the basic aim of which is development and adoption of automated control systems. Some of them have gone over to a sort of reproduction of automated control system projects and the dissemination and securing of model projects.

But the reserves for increasing the effectiveness of automated control systems are far from exhausted. And there is only one way here—an organic synthesis of techniques and mathematical methods. This must become the basis for the development of automated control systems in the 11th Five-Year Plan.

The introduction of scientific methods of labor organization and management of production have had a beneficial effect on the efficiency of operation of enterprises. At all plants and factories comprehensive plans for the scientific organization of labor have been worked out and are being put into practice; many enterprises are doing research work in this field on the basis of operational agreements with scientific organizations. Through the introduction of measures relating to scientific labor organization, outlays of work-time this year have been reduced by 1.8 million norm-hours. Working conditions have been significantly improved.

Broad possibilities for the economy are opening up also in the field of utilization of material resources—tools of labor, raw materials, fuel and other materials, especially if it be kept in mind that in recent years their relative share has been growing in product cost and in a number of cases exceeds the effect from economy of living labor. As a result of this, outlays per product unit in a number of sectors of industry are increasing rather than decreasing.

Let us use machine building as an example. At machine-building plants in Tbilisi, Batumi, Kutaisi and other cities in the republic, a significant part of the equipment has been operating for a long time; progressive methods of machining parts are not being adequately introduced; the share of machining metals by cutting is still high, in which connection labor outlays and wasted metal are unjustifiably high. A great deal of obsolete equipment is to be found at plants of the ministries of light, food and local industry. Manual labor is still used often. There is a lag in technical development and mechanization at freight stations, loading and unloading operations at railroad sidings of enterprises, and motor transport is not always used effectively.

We must secure a reduction in the norms of expenditure of boiler-furnace fuel, electric and thermal power, gasoline and diesel fuel in motor handling of freight.

If all the fuel and power resources were to be added together that would be used by us in the republic in 1980 (petroleum, coal, hydroenergy, fuel, firewood and the like), the total would be astronomical--as much as 200 millions tons of conventional fuel.

The ways of economizing are many; furthermore, there are such that do not require significant capital investment and produce a rapid effect.

A great deal of fuel is spent needlessly in production--solely because of poor heat insulation of steamboilers and equipment. There are also great losses from unneeded operation of electric motors, incomplete loads of heating furnaces, empty runs of motor transport and the like. Everyone knows of such channels of loss. At many enterprises, a complex of measures has been developed for economizing of fuel and power resources, but they are not being put into practice everywhere.

Industry uses the most fuel--62 percent of total consumption. That includes production of electric and thermal power, which uses 46 percent. A second large use is municipal and everyday services and the population. Their share of consumed fuel is 11 percent.

The chief reserves for saving of fuel are to be found in industry. As a result of implementation of measures for economizing of fuel and power resources in the national economy of Georgia, expenditure of energy this year compared to the set limit has been reduced by 91,100 tons of conventional fuel; there have been saved 197,600 gigacalories of thermal energy and 121.5 million kilowatt-hours of electric power.

At thermal electric power stations of the Gruzglavenergy System, fuel expenditure for the production of one kilowatt-hour of electric power has been reduced by 1.17 gram, which has made it possible to save 9,500 tons of conventional fuel.

But such a condition in the economy of fuel and power resources does not prevail everywhere. At many enterprises and construction sites and in housing and municipal services, fuel and electric and thermal power are still not being used efficiently; large losses and expenditures above set norms are allowed to occur, while heads of enterprises fail to take necessary steps to things in order.

Take that same electric power. During 1978 2 billion kilowatt-hours were lost in the electric-power network. This quantity of electric power exceeds its total output in Georgia in 1955. Losses of electric power in transmission are naturally inevitable, and their high level is due to local specifics, but the significant divergence of this indicator from the all-union is nonetheless unjustifiable and calls for serious work in the given direction.

Reduction of losses of electric power compared to its production on electric-power transmission lines of the republic makes it possible to save 126.4 million kilowatt-hours.

Significant economies of fuel and power can be achieved at ferrous-metallurgy enterprises. For example, the equipment of melting down units at open-hearth, blast and other furnaces at the Rustavi Metallurgical Plant will make it possible to save in the immediate future approximately 10,000 tons and later on--67,000 tons of conventional fuel.

At the present stage, adoption by production of achievements of scientific-technical progress on a wide scale should be considered a basic direction for economy of fuel and power resources. According to data of the All-Union Scientific-Research Institute of Complex Fuel-Power Problems attached to Gosplan SSSR, it will be possible to obtain in the future 60 percent of all savings of fuel and power resources in the national economy through the introduction of efficient equipment--generating, fuel- and power-use, progressive manufacturing processes, machinery and installations with low specific fuel and power expenditure per unit of product output and performed work and also the replacement and modernization of obsolete equipment.

A significant reduction of fuel consumption per product unit will result from the modernization of the Tkvarchel'skaya GRES. Here the basic power equipment will be completely replaced and a new unit with a capacity of 110,000 kilowatts will also be installed. Following the modernization and expansion of the Tkvarchel'skaya State Regional Electric Power Station will have an output of 1,250 million kilowatt-hours of electric power and, what is particularly important, the specific expenditure of conventional fuel for each kilowatt-hour of electric power will be reduced from 573.6 to 500 grams, or 12.8 percent. Comparable results will be obtained from the modernization of the thermal electric power station of Batumi Petroleum Refinery. Here the specific expenditure of conventional fuel per kilowatt-hour of produced electric power will be reduced to 350 grams and per gigacalorie of thermal power to 170 gigacalories.

Considerable work on economy of fuel and power resources on the basis of technical progress is also being done at Tbilisi GRES, the Rustavi metallurgical and chemical plants and other enterprises in the republic.

In the solution of problems of economizing fuel and power resources, major importance is attached to strengthening of working ties between science and production, the creative cooperation of innovators and specialists of enterprises with scientists of sectorial, scientific-research, academic and educational institutes. Many examples could be cited of such fruitful cooperation. The creation by scientists and production people in our republic of a technology of producing resins for woodfiber and woodshaving board, ion-exchange materials for water treatment and a number of insulation materials reduces expenditure of electric power in the national economy by millions of kilowatt-hours.

Here also additional reserves are to be found. This applies particularly to use of wastes. The Georgian SSR Academy of Sciences together with the republic's Economics Institute and other scientific organizations must work out recommendations for more efficient and complex use of mined raw materials.

One of the basic reasons in looking for internal reserves is lack of regulation in the norm setting of raw and other materials, poor record keeping of material resources at many enterprises and supply and sales organizations, which also has a negative effect on productive activity. At many enterprises there is a lack of the proper equipment, conveyor lines, sectors and special shops for reprocessing of wastes.

It would appear to be useful to create a single republic center that would assume the direction of all processes relating to detection, classification, sorting, distribution and sale of production wastes formed at enterprises.

Among important measures for rational use of fuel and power would be a further improvement in the structure of the fuel and power balance for the purpose of detecting possibilities for economy of deficit fuels and replacing them with less deficit ones, as well as further centralization of heating resources for residential, public and cultural-everyday facilities and for other institutions, replacement of obsolete equipment of boiler rooms, taking down small boilers and putting up larger ones, glassing in of all industrial and civil structures, putting in order entranceways of houses and so on. The ispolkoms of oblast, city and rayon soviets of people's deputies and their municipal and everyday services ought to give much attention to these questions.

The municipal and everyday services of cities, rayon centers and other residential areas should more carefully prepare for the fall-winter season, put in order ahead of time heat networks, heating, ventilation and hot-water systems and heat residential, production and public buildings. The operation of the transport conveyor, which is meant to ensure timely deliveries of fuel to the consumer, should be improved.

Personnel of railroad, maritime and motor transport and industrial enterprises should raise the level of conveyance by through freight trains and reduce to zero layovers of railroad cars, tank cars and motor vehicles and also mechanize and automate loading-unloading operations.

An important way of saving fuel and power resources under the conditions of Georgia lies in expansion of the use of thermal waters. In a number of places in our republic (Kindga and Okhuren in Ochamchirskiy Rayon, Tsanshi in Zugdidskiy Rayon, Tbilisi, Samtredia, Tskhakaya and others) such waters are open, which is of great practical value. Their aggregate thermal potential converted into conventional fuel exceeds 200,000 tons a year.

At the present time, natural thermal waters are supplied to several residential quarters of Tbilisi, saving each year about 10,000 tons of conventional fuel. For the republic as a whole this way could save by 1980 something like 182,000 tons and in the subsequent period 225,000 tons of conventional fuel.

Finding ways of rationally using and saving fuel and power in the national economy constitutes an extremely urgent problem, a work of major state importance. And no matter to what extent the wealth of our society might grow, strictest possible economy and thriftiness remain a most important condition for the development of the national economy and upgrading of the well-being of the people, it was emphasized at the 25th CPSU Congress. Directors of enterprises, construction sites and institutions, all workers of town and country and the entire public must give their attention to this.

It is necessary to always remember that economy is a law of management.

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ECONOMIC PROBLEMS OF SCIENTIFIC-TECHNICAL DEVELOPMENT POLICY

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 9, Sep 79 pp 101-107

[Article by S. Kheyman, Doctor of Economics, Professor: "Economic Problems of Scientific-Technical Policy"]

[Text] The development and implementation of a unified scientific-technical policy and of an organically related structural policy for the socialist state occupy a special position in the management system of the processes of national production development.

Scientific-Technical Policy and Its Role in the Development of Production

Progress in science and technology is largely determined by inherent regularities. However, under modern conditions it also depends on the material and manpower resources of society, on the quality of scientific instrument production, and on the level at which scientific and technical institutions are supplied with modern equipment. Expressed here is the dialectic of the interaction of productive forces and production relationships, of the foundation and the superstructure.

Progress in productive forces increases the possibilities for society to create fundamentally new, more powerful and productive means of production, which, in turn, make growth possible not only in man's material, but also in his spiritual resources. In this way the personal factor in productive forces and its influence on their material components are increased.

In conjunction with an improvement in productive forces, the role of the socialist state is made more active in the long-term and operational planning and organization of the process of expanded production. The state develops the economic policy which determines the social program, the goals, and the primary directions of society's production activity. This policy is materialized on the basis of the development and subsequent implementation of the scientific-technical, structural, and organizational-production policies. These policies, in turn, taking into account the

tasks of the economic policy and in accordance with the social program, determine the directions of development of science and technology, changes in the structure and organization of production, and the system of the economic mechanism which provides for purposeful functioning of social production.

In this way the state scientific-technical policy serves as the connecting link between the economic policy of the socialist state and the complex of "science-technology-production." It determines the following:

- the priorities in the development of basic and applied science;
- the priorities in the development of the primary natural and social sciences and the combinations of the most urgent social problems demanding attention;
- the priorities in the development of technical systems and the primary directions for changing the material and physical structure of technology itself, namely, the tools of labor and the production apparatus and the objects of labor and manufacturing, for all branches of social production;
- the specific directions for complexes of branches and indirect production (associations) for technical, industrial, and organizational-production decisions;
- the principles of production organization, namely, the primary directions for its specialization, combination, and concentration, especially in machine building production which is important in the implementation of technical policy;
- the criteria for the socioeconomic effectiveness of scientific-technical progress, that is, the requirements imposed on technology from the point of view of the content and nature of labor and the preservation of the surrounding environment;
- the directions in the area of utilization, amortization, replacement periods, repair, and updating of equipment.

The scientific basis for the development of this policy includes research into the following:

- the economic strategy of society, the sum total of its current and prospective needs, that is, the social and economic goals which it sets for itself for the foreseeable future;
- the structure of the expenditure of national labor, namely, the operational, sectorial and regional structures which characterize and localize the units of social production which possess the greatest resource intensiveness and which require immediate technical retooling;

--the logic and prospects for the development of science and technology according to their primary directions and taking into account their economic effectiveness.

Scientific-technical policy is connected to state structural policy. Scientific-technical progress does not result in the formation of models of new technical means and materials as it does in new manufacturing methods. This is only its initial stage. Scientific-technical progress finds the capacities in the process of production materialization, when its results begin to establish the appearance of physical production and when they occupy the weighty, and, in time, determining position, that is, they become its structural subdivisions. Examples of this are atomic and nuclear power plants, automated equipment, and the production of polymers; whose directions are technically determined, but so far they have not occupied a predominant position in production anywhere in the world.

Consequently, scientific discoveries and technical solutions by themselves still do not guarantee the realization of their possibilities in physical production. Necessary for this are the corresponding structural improvements, that is, the formation and development of the branches (power engineering, machine building, chemistry, and so on) which produce new technical means of materials, together with the branches in which these new means of production and manufacturing find practical application.

Purposeful state planning and financing of scientific-technical progress is the material base for the realization of a unified, state scientific-technical policy.

Scientific-Technical Policy in the Struggle with Inertial Tendencies

An enormous economic and scientific-technical potential has been created in the USSR. In 1978 the fixed production capital of the national economy exceeded one trillion rubles, and expenditures by the branches of physical production (without amortization) exceeded 500 billion rubles. In 1977 the amortization allowances for this complex of branches amounted to 56 billion rubles.

This huge economic potential consists, of course, of gigantic possibilities, yet at the same time of a gigantic inertial mass of historically formed forces which reflect the technical level of the period of their creation and the inertia of the structure and organization of production. Therefore, realization of the possibilities of the contemporary scientific-technical revolution requires that the inertia be overcome, which presupposes a long-term and purposeful mobilization of the enormous production resources which comprise a fully developed production organization.

Here society encounters an important peculiarity of the inertial processes in the national economy, namely, the tendency of the inertial mass toward "self-reproduction" or toward expanded reproduction, that is, toward the continued output of customary and assimilated producer goods.

Society's scientific-technical and social-economic progress depends to a significant degree on overcoming inertial forces. Determining the ways and means of overcoming them is the greatest problem of economic strategy for socialist society.

A decisive role is played in counteracting and overcoming inertial tendencies by the development and implementation of technical policy based on the formation and development of appropriate structural subdivisions in national production, by the orientation of the economic mechanism to the stimulation of progressive improvements, and by breaking with inertial decisions. Before moving to an examination of the primary problems of scientific-technical policy, it is worth dwelling on the exceptionally important complex of conditions, on which depend the overcoming of inertia and the active technical reequipping and renovation of the production system of the national economy. The initial link in this complex, in our view, is to provide for balancing out the plans and, primarily, the programs of capital investment.

Practice has convincingly demonstrated the following interrelationship: an unbalanced plan means a "planned" shortage; a shortage means an unavoidable consumer "omnivorousness" both with respect to producer goods as well as to consumer goods, and which serves as a nourishing environment for inertial tendencies. It is obvious that shortages of goods remove the stimuli for the producers to meet the interests of the consumers. Implementation of the vitally important directive of the 25th CPSU Congress "to give the consumer greater opportunities to influence production," will counteract the existence of a shortage. Such a situation brings to nothing the possibility for creating the conditions for natural selection of the best achievements in science and technology, will weaken feedback, particularly in the production of producer goods, and accordingly will limit the stimuli for the development and production of fundamentally new producer goods [sic].

Such are some of the initial positions which, in our view, it is necessary to consider in the process of developing and implementing the basic directions of scientific-technical policy.

Several Problems of the Policy in the Area of Science

The long-term policy of the Soviet state in the area of science is based on the necessity of large-scale development of basic theoretical research in all major branches of the natural, technical, and social sciences. The role and tasks of the social sciences are of great significance.

In point of fact, a unified state scientific-technical policy in a mature socialist society concretely defines the requirements which society imposes on scientific-technical progress. It selects those scientific-technical, organizational-technical, and organizational-production directions

and decisions which provide the optimal conditions for satisfying the social requirements for a developed and ever-developing socialist economy. Economics and other social sciences play the leading role in the development of the scientific base of this "social order," as well as in the description of the current and foreseeable needs of society in the entire complex of material and spiritual wealth; including the composition, conditions, and character of labor itself, the structure and technical equipment in the area of services and the dissemination of knowledge and spiritual wealth linked to the building of the material-technical base of Communism.

Progress in social relationships and the creation of a new man and his form of life are directly tied to the creation of the base of scientific-technical policy. Science, physical production, and the area of services and knowledge dissemination are all interrelated fields. Their development is the basis for improving social relations and the creation of the new man will occur in these fields. They comprise all the material components of the new form of life: the housing and personal conditions, the forms of association, the level of culture and spiritual potential, the forms of rest and recreation, and so on, and they provide for comprehensive development of the basic and applied sciences. The task consists of correctly determining those requirements which each of these fields impose on scientific-technical progress and physical production.

State policy in the area of the development of the natural and technical sciences is oriented toward the combination of further expansion of basic theoretical research in all branches of human knowledge with the study of the most vital problems facing the national economy in the foreseeable future. This general course of scientific-technical policy is defined specifically in each complex of the natural sciences.

Expansion of research in theoretical and applied mathematics is accompanied by the expansion of scientific efforts to improve and effectively utilize electronic computer technology in the national economy and by the use of mathematical methods in scientific research in areas of all the natural and social sciences and in the planning process for economic production and its management.

Theoretical and experimental research in the area of physics is connected to the development of nuclear power engineering, to the creation of the scientific-technical base for thermonuclear power engineering, to improvements in existing means and the development of new means of processing energy, and to the creation and extensive introduction of new equipment and new construction, magnetic, semiconducting, superconducting, and other materials. Concurrent with the development of basic chemical science is the expansion of research in the area of synthesizing chemical compounds to obtain substances and materials with new and previously assigned characteristics, the creation of new chemical processes with highly efficient catalyst systems which cause significant acceleration of chemical reactions, and the development of the scientific base for manufacturing which primarily utilizes closed cycles and is gradually transferring to wasteless processing methods.

Comprehensive development of biological science is tied to the determination of ways to hasten solution of the most important medical and biological problems in the battle with various diseases. Particular importance has been acquired by the development of the genetic theory and methods for significantly increasing agricultural productivity, for creating new and valuable types of plants and breeds of animals, as well as for establishing means for obtaining physiologically active substances for medicine, agriculture, and a number of branches of industry. Tasks facing science also include the development of the scientific base for efficient use and conservation of soil, mineral resources, the plant and animal world, and the air and water basins; and expansion of the study of the world's oceans, the earth's core and upper mantle, and of the study and exploration of space.

In the development of each great complex of problems, state scientific-technical policy is based on the necessity of solving two sets of problems--namely the material-technical, which determine the most important directions of technical and industrial decisions and the social-economic, which determine the economic and social aspects in the selection and utilization of technical means.

Problems of Technical Policy in the Area of the Primary Elements of Production

Facing the power engineering base, which is called upon to provide the complete electrification of production and of the nonproductive area of everyday life, are the following main tasks:

- improvement of the technology and methods of coal mining (particularly the open-pit method) and expansion of oil shale mining in the European part of the country;

- overall automation of production processes and the introduction of automated control systems in the branches which extract and process the advanced types of fuel, namely, oil and gas;

- and the development and introduction of new types of energy, primarily nuclear, together with the utilization of fast breeder reactors.

The creation of thermonuclear power engineering will have great importance. However, thermonuclear power, as is also the case for uranium and all types of artificial thermal and hydraulic power, does not eliminate the dangers for the biosphere. It is well known that the production of energy on a scale comprising at most a few percent of the solar heat received by the planet could result in global warming and to irreversible changes in the biosphere and climate.

Therefore, one of the most important problems of energy supply is the utilization of the sun's energy. Theoretically, it would be possible

to obtain more than one trillion kilowatt-hours of electrical energy from an "energy field" in the Karakum desert with an area of 70 square kilometers and covered with solar batteries. The practical solution to this problem requires a reduction in the cost of solar batteries by several multiples of ten.

The problem of the use of geothermal energy and of the force of the wind also requires further scientific-technical study. An important direction in the development of power engineering is the creation of the most advanced and effective industrial methods for obtaining electric energy, including the use of MGD-generators (magnetohydrodynamic), superconductivity, and so on. The efficient production of energy (especially electric) must be combined with its efficient use. This problem presents a complex of scientific-technical problems to machine building, both for power engineering and for electrical engineering. It is necessary to create advanced and economically sound electrical and thermal generating units as well as power receiving and power transmitting and transforming equipment. And of particular importance is orientation toward equipment production which yields a high energy-producing result with a relatively small physical loss of energy. Such a tendency is already taking place, and its development will allow a steady rise in the beneficial effect of electrification and central heat supply without growth in energy production.

A progressive scientific-technical policy in the area of the implements of labor is of key social and technical-economic significance. This important element of the production forces determines the capacities, the technical level and effectiveness of the production unit, and consequently the possibilities for increasing physical production and equipment for the areas of services and science, as well as the content, conditions, and nature of the labor process, that is, the solutions to the fundamental problems in the building of Communism.

The most important problems in the creation of the material and technical base of Communism, that is, both the socioeconomic and the production-technical, are being solved in the above sphere. It is necessary to establish a system of machines which is adequate for the material and technical base of Communism. Apparently this will be a three-component system consisting of the following: automated operating machines, cybernetic analog and computer and controller equipment (primarily electronic, if it is based on the current experience of the highly developed countries), and servomechanisms, which provide direct and feedback communication between workers and cybernetic machines. With certain modifications, this system will be typical for the primary branches of the national economy, although the process of its implementation, considering the characteristics of such branches as agriculture and construction, can be of very long duration.

The first component of the above system must be introduced by the most extensive selection of industrial equipment for the widest variety of branches of production. The second and third components constitute a wide field for the most productive unification and normalization of

both cybernetic and servomechanism systems. The second component also forms the basis of the machine system for a number of the branches of intellectual work in which the subject and product of a great mass of workers is information, that is, this component plays an important role in meeting the planned task of unifying intellectual and physical labor in the productive activity of the people.

Machine systems are being introduced in all areas of human activity. This presents the technical policy with the task of determining the specific structure of the machine system and its technical equipment, which must be produced by machine building. The development and individualization of the specific structure must be utilized in the process of specialization and problem solving for the organization of the structure, both for machine building production and for the system of branch scientific research and plan and design institutes.

In our view, the basic components of a specific structure are the following:

- the industrial and auxiliary equipment (transport and moving, control, packing, warehousing, and so on) for all branches of physical production;
- scientific and experimental equipment and instruments;
- machines and equipment for all branches of service, namely, housing and municipal services, the area of everyday services, the vacation and recreation "industries," retail trade and public dining (including a wide range of automatic vending machines), education and health services (including instruction, television broadcasting, diagnostic, operating and therapeutic equipment, and special types of electronic computers);
- equipment for personal, everyday use.

The implementation of the directives of the 24th and 25th CPSU Congresses concerning orientation toward the production of machine systems rather than toward the production of separate types of equipment must manifest itself in the following:

- in the production together with the basic equipment of the necessary complete adjusting and finishing equipment assemblies which provides for high reliability, economy, and efficiency in its use by consumers, and for its competitive ability on world markets and which will require the creation and development of branches which will form a reliable material base for drastic improvement in the quality of all types of products manufactured by the nation's industry;
- in the production of sets of interchangeable implements of labor for self-propelled equipment;

--in the production of a selection of interchangeable and repairable assemblies and parts in accordance with scientifically based shift coefficients which are sufficient for the entire period of use of a given piece of equipment, in the production of sets of equipment accessories (and, where necessary, of programs) and special instrumentation which provides for efficient use of equipment;

--in the production of a periodically updated selection of assemblies and units for equipment renovation;

--and in the conformity of the model size structure of manufactured machines and its differentiation of the real requirements of the branches which use the specific equipment. This affects both basic and auxiliary equipment, particularly materials handling equipment with respect to carrying capacity. Also, depending on the nature of the operations being conducted, complex and simpler forms of equipment must be combined.

For the production of associated equipment there must be corresponding standards developed, which take aspects of social effectiveness into full account, including equipment safety provisions, protection of the surrounding environment, elimination of difficult, low skilled, unskilled and monotonous labor, and so on.

Such, in our view, are the general characteristics of the structure of the implements of labor and of the basic technical systems for the current stage and for the foreseeable future.

Technical policy must allow for the directions, scale, and time parameters of the structural improvements in each of the described aspects. Correspondingly, in the long-range plan for the development of machine building it is important to note the ways and sequence of formation of the enumerated types of equipment and the gradual compliance of the needs of production to it.

Scientific-technical policy must allow for and bring about in the national economic plan the creation of a system of contemporary machines which form progressive structural complexes. This interrelation of scientific-technical and structural policy will be the most important factor in overcoming inertial tendencies and in the systematic increase in the technical level of the production system of the national economy of the USSR.

For the past several decades oxygen-converting and electric steel smelting methods have been predominant in steel smelting. From 1960 through 1977 the smelting of steel in the USSR has increased by more than 81 million tons. At the same time, smelting by means of the above advanced methods has grown to 46 million tons, that is, there have been continued increases in capacity using old, less effective methods (the open-hearth process). As a result, the relative share of the new, advanced methods in the overall total of steel smelting in the USSR in 1977 amounted to only 37 percent,

although modern equipment allows 80 to 100 percent of the steel to be obtained through the new, more effective methods.

Considerable investment resources were expended, but not entirely in progressive directions, rather, predominantly in traditional directions. An analogous situation also occurred during these same years in the development of rolled metal production. Sheet metal has occupied an unjustifiably small place in its growth, particularly light-gage and cold-rolled, and a correspondingly greater place has been occupied by graded rolled stock and plate metal.

Also lagging in development is the production of forging and pressing equipment, which is necessary for improving the structure of metal working and, in particular, for the introduction of less metal consuming rolled sheet metal. In machine building in the USSR in 1978 only 19.7 forging and pressing machines were needed per 100 machine tools.

It is apparent that for the effective implementation of a progressive technical and structural policy, the subjects of production planning and of its technical equipment must be the sector and subsector (steel smelting, the production of rolled metal, metal and wood working, and so on) and their structure and systematic improvement taking into account the latest tendencies of scientific-technical progress. One more vital problem of technical policy is related to this: for which sectors and processes should basically new equipment be created first, and how should the newest, complex, and expensive technical equipment be combined with the simple and inexpensive equipment?

As is well known, the USSR has moved into first place in the world in the production of machine tools with ChPU (digital programming control) the most modern automated equipment. In 1977 the quantity of machine tools manufactured in the USSR was 6552, in the USA, 4221, and in Japan, 5197. The priority is obvious. About which machine tools are we speaking. After all, ChPU can be adapted to traditional and by no means most progressive and productive multistation processing centers, in which ChPU provides maximum yield and capacity. Yet the share of machine tools manufactured in 1977 with ChPU did not reach five percent. It is apparent that this is not the most effective utilization of the new, progressive technology. Here too everything was decided within the limits of machine building itself.

An example of the combination of complex and simple equipment relates to machine building itself. As is well known, the operations of cutting (cutting stampings of various cross sections) and threading (cutting external and internal threads in multiple machine parts and in every possible holder) occupy a large place in the structure of the numerous operations of metal working. In our machine building these operations, as a rule, are done by complex and rather expensive lathes and turret

lathes. Meanwhile, as is shown by advanced practice, they are successfully carried out, with significantly less cost, on simple and inexpensive cutting and threading machines, which significantly lowers the output to capital ratio and the labor-intensiveness of machine-building production.

The same vital problem, related to the quality of machine building production, is presented by the relationship of grinding and honing and finishing operations, which provide for a high degree of precision and finish in the equipment produced.

The combination of the most modern and complex equipment with the simplest and cheapest to perform, where necessary, simple operations is the specific principle of economic flexibility deserving steady attention. Its non-observance, namely the extensive use of metal, capital, and labor intensive methods of cutting instead of the more economical ones of shaping and welding, the use of complex equipment where simple equipment is sufficient, insufficient supplies of trimming and finishing equipment, and so on, all worsen the relationship of "cost to output" and the quality of the final product as well.

Technical policy must orient the development of equipment and technology as well as the planning of production organization to the observance of the principle of flexibility, that is, to providing the opportunities for rapid and economic changeover of production lines to the output of new products, for rapid and economical modification of the means of labor, and for effective production not only of mass-produced and large series goods, but also of small series and custom products, the proportion of which in the foreseeable future will hardly decrease significantly. Providing flexibility is tied to a complex of measures which call for the following: the extensive

--the extensive unification and normalization of machine parts and units and other items;

--the standard-unit principle in the creation of equipment;

--the specialized production of quickly adjustable accessories and the manufacture of machine tools adapted to the rapid change of accessories,*

--the orientation of automation in machine building and other branches to machine tools and equipment with programmed operation;

--the flexible planning of shops and sections and of power and other supply lines.

* Machine tools and other machines are being converted more and more into a long-term and reliable base on which parts and accessories are alternated. Inasmuch as the base assemblies (machine tools and so on) are the most materials-intensive, this will also facilitate a reduction in materials-intensiveness.

taking into account the high capital and labor-intensiveness of the complex of branches which provide raw materials and fuel and which manufacture materials, progressive technical policy with respect to the objects of labor acquires great urgency. Its most important direction is the improvement in the quality of all production materials. This concerns not only the development of special production of high quality steel and other materials, but also the significant and systematic increase in the quality of the bulk of these materials, that is, the universal introduction of reprocessing to strengthen and improve quality as a basic part of the manufacturing process. The production of the objects of labor must be oriented toward more complete and effective fulfillment of social needs, both with respect to the qualitative characteristics of the materials, taking into account the conditions of their utilization (the nature of the use, the climate, and so on) as well as the dimensional parameters of their assortment (the assortment of rolled stock, reduced profiles, approximation of the shape and features of the finished product already in the production stage, and so on).

Sectors producing the objects of labor must accept an even greater portion of the work in preparing materials for their final utilization and must carry out a number of functions of initial forming. This conforms to the general principle of technical policy formulated at the 25th CPSU Congress, namely, orientation to the consumer.

The social aspect of technical policy dictates that in the development and creation of artificial and synthetic materials it is necessary to allow for their natural decomposition in the course of their period of service.

One more important direction is tied to the general task of lowering the bulk of the national product. Realization of this direction requires the development and implementation of a complex of planning and design, manufacturing, and economic planning measures which provide for a reduction in the bulk of fuel, construction materials, and manufactured articles.

Technical policy in the area of the purposeful and progressive development of manufacturing is of paramount importance. Its most important directions include: the development of progressive types of low-operation manufacturing, such as nonblast furnace and powder metallurgy, nonspindle spinning, and nonshuttle weaving, orientation of manufacturing processes to maximum economy in raw materials, fuel and resources, to maximal recovery from them of all useful components, to a reduction in waste products, and in the future to a predominance of wasteless manufacturing as well as total protection of the surrounding environment. The problems of scientific-technical policy, by their very nature, must be solved on a complex and systems basis. One of the most urgent problems is the effectiveness of the "machine building-metallurgy" complex.

The enormous scale of the production and use of metal and the significantly increased labor, capital, and metal-intensiveness of machine building are to a large extent tied to the predominance of casting and graded rolled stock over sheet metal. As analysis has shown, the percentage of sheet metal in the same type of equipment in the USSR is significantly less than it could be in analogous designs. For example, the share of sheet metal in agricultural machines in the USSR amounts to 31 percent, while in the USA it is 54 percent, for metal cutting machine tools it is 23 and 45 percent, in household refrigerators 61 and 93 percent, in washing machines 63 and 93 percent, and so on. At the present time the designs for the machines and the equipment for their production are oriented toward graded rolled stock, as a result of which millions of tons of metal, labor, and other resources are overexpended. Therefore, it is necessary to reorient machine design to sheet metal, to expand its production, to significantly increase the output of equipment for processing it, and to expand the production of equipment for producing quality sheet metal (light-gage and cold-rolled) and for fabricating modern presses and other machines for processing it. An important principle of technical policy is the provision for leading growth in the productivity of new equipment with respect to its cost.

Scientific-technical policy is being developed while taking into account the prospects of progressive development of mature socialism and its development into a communist society. There is complexity in this and at the same time a constructive role for a unified, state scientific-technical policy.

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EVALUATING ECONOMIC IMPACT OF INDUSTRIAL MODERNIZATION

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[Article by Yu. Kushcheyevskiy: "Evaluating the Economic Effectiveness of Modernization"]

[Text] A procedurally valid evaluation of the economic effectiveness of capital investments in industrial modernization assumes comprehensive consideration of the characteristics of the modernization and its differentiation from new construction and from the expansion of operating enterprises. Meanwhile, incorrect interpretations and even confusion in the forms mentioned for the reproduction of fixed capital are tolerated in capital investment planning, because of which the effectiveness of the selected directions of production development are distorted.

Modernization is most often identified with expansion, although according to its nature expansion is more similar to new construction. Both expansion and new construction are distinguished from modernization primarily by the supplementary expenditures of resources and time for the creation of new production buildings and areas.

Modernization is mainly linked to the substitution of obsolete and physically worn out operating units of fixed capital. And only on this basis, according to new manufacturing diagrams, are the passive elements of fixed capital reorganized on a set scale. The installation of new production areas and buildings is possible, both in the process of reorganization and expansion. However, in expansion this means industrially self-contained, closed projects which are installed at the location of the operating enterprise or in areas adjacent to it and does not mean structural additions to a previously created manufacturing chain for basic and auxiliary production.

Included among the most important features of modernization, in comparison with new construction or expansion, must be the lower requirement for manpower to provide the same added growth in production. Almost no natural resources are used in modernization. New construction and sometimes the expansion of operating enterprises are accompanied by the

removal of land parcels from agricultural use and an increase in the scale of environmental pollution. The financial losses which society bears in this are not simply determined by the dimensions of the assets invested in the land removed. Included here should clearly be the expenditures for the production of additional agricultural products related to the removal of specific land parcels as well as the expenses for preventing water and air pollution.

The features discussed significantly complicate the evaluation of the economic effectiveness of modernization as a form of expanded reproduction of fixed capital. The calculation system in use in planning practice includes a comparison of the minimum adjusted expenditures for the type of modernization with the economic indicators for new construction, which are calculated using the corresponding accepted standards for proportionate capital investments and current expenditures.

Such an approach has been brought about by the tendency to "tighten" the technical and economic indicators for industrial projects being modernized to the contemporary level. However, all calculations in this effort are oriented only to production expenses and do not permit an evaluation of the economic impact of the diversion of financial, labor, and production resources to new capital construction, which in the final analysis understates the value of the effectiveness of modernization.

In our view, a well-founded economic comparison of modernization with new construction is possible only when there is correct evaluation of expenditures for reproduction of manpower, taking into account expenditures for creation of public consumption funds and real national economic losses due to the removal of natural resources from agricultural use. Without such evaluation all calculations of the relative economic effectiveness of modernization and new construction do not have the validity which is usually afforded them.

Evaluation of the relative economic effectiveness of capital investments in the modernization of a specific industrial project is important in cost accounting practice. At the same time, the selection and implementation of the best plan from the position of cost accounting are often accomplished at the expense of ineffective capital-intensive measures from the national economic point of view.

Let us examine, for example, two plans for the modernization of an enterprise with an estimated cost for the work of 14 million rubles for the first plan and 21 million rubles for the second, and the construction periods are 3 and 4 years, respectively. The production cost of the yearly product output and the adjusted expenditures in the first plan are 80 and 82.1 million rubles and in the second, 78 and 81.1 million rubles. Inasmuch as the adjusted expenditures in the second plan are one million rubles less than the first plan, the second plan will be

given preference. This would make it possible to increase the amount of profit after modernization. However, the adjusted expenditures do not reflect the effect on the national economy resulting from the release of part of the capital investment in the selection of the less capital-intensive plan. Such a selection, according to the conditions of the example, immediately releases 7 million rubles of capital investment which can be directed to the technical improvement of production in other areas of the national economy. The relative effectiveness of these measures must be near the accepted standard.

When $E_H = 0.15$, the use of capital investment resources ΔK saved in the selection of the first modernization plan yields the effect ΔKE_H , in the first year, or approximately 1 million rubles. In the second year these means are again directed to the development of technology and the effect $\Delta KE_H (1 + E_H)$ will be 1.2 million rubles. For the t year the effect will amount to $\Delta KE_H (1 + E_H)^{t-1}$.

Meanwhile, the yearly savings in adjusted expenditures $\Delta 3$ under the conditions of the selection of the more capital-intensive modernization plan can be used for needed technical development of production. However, this savings can be obtained not earlier than after the first year of operation of the modernized enterprise, that is, with the elapse of t_{p2} years (t_{p2} is the length of time of the modernization period according to the second plan). The result follows from this that the total effect $\Sigma \Delta K_{t_1}$, which the national economy can obtain as a result of selecting, the t_1 less capital-intensive (the first) modernization plan, amounts to

$$\Sigma \Delta K_{t_1} = \Delta K + \Delta KE_H + \Delta KE_H(1 + E_H) + \Delta KE_H(1 + E_H)^2 + \\ + \dots + \Delta KE_H(1 + E_H)^{t_1 - t_{p2}},$$

where t_1 is the average service life of fixed capital stipulated by the first modernization plan. If we assume that, with a service life of the fixed capital for modernization under the second plan t_2 , and that the yearly savings in adjusted expenses $\Delta 3$ are directed to the technical improvement of production, then the total effect on the national economy will be:

$$\text{for the first year} \quad \Sigma \Delta 3_t = \Delta 3 + \Delta 3E_H + \Delta 3E_H(1 + E_H) + \dots + \\ \Delta 3E_H(1 + E_H)^{t_2 - 1};$$

$$\text{for the second year} \quad \Sigma \Delta 3_2 = \Delta 3 + \Delta 3E_H + \Delta 3E_H(1 + E_H) + \dots + \\ \Delta 3E_H(1 + E_H)^{t_2 - 2};$$

$$\text{and for the last year} \quad \Sigma \Delta 3_{t_2} = \Delta 3;$$

Thus the relative economic effectiveness of the modernization plans depends on the duration of the modernization period and on the average service life of the fixed capital. In determining average service life in calculations one can begin with the average, accepted standard for deductions for renovations on projects being modernized.

The selection of the more capital-intensive modernization plan is economically advisable under the following conditions:

$$\Sigma \Delta \beta_1 + \Sigma \Delta \beta_2 + \dots + \Sigma \Delta \beta_{t_2} > \Sigma \Delta K_{t_1}.$$

It follows from the above expression that with equal adjusted expenditures for the variants of capital investments being compared, the less capital-intensive modernization plan is preferred. In the above example, with a service life of 10 years for the modernization fixed capital in both plans, $\Sigma \Delta K_{t_1} = 57$ million rubles, and the total national economic effect as a result of the savings in adjusted expenditures specified in the second modernization plan amounts to 23.2 million rubles for this period.

It follows from this that it is sound practice to select the first modernization plan (the impact amounts to 33.8 million rubles). If in the first plan the service life of the capital replacement is less than specified in the second plan, for example, $t_1 = 8$ and $t_2 = 14$ years, then the second modernization plan should be selected, since in this case the national economy would experience a greater impact than from the savings in capital investment by 3 million rubles (46.1 and 43.1 million rubles, respectively).

The system used in calculations for determining the national economic impact according to the modernization variants is based on the assumption that the entire result of the investments is directed yearly into the savings fund. Under real conditions a significant portion of this result goes to expansion of the workers' consumption fund.

However, in compliance with the conditions for the comparison of calculations, it is possible to use an assumption in the evaluation of the economic effectiveness of capital investments. The above presentation allows us to conclude that the interests of the cost accounting unit and those of the national economy do not completely coincide in the evaluation of the effectiveness of capital investments in operating production. The advisability of enterprises selecting plan variants for capital investments according to a minimum of adjusted expenditures stems from the tendency toward increasing the individual effectiveness (the profitability) of production, which is sometimes achieved at the expense of growth in the output-capital ratio for production, which is not justified from the point of view of national interests. Society has become

interested in the steady growth in the volume of industrial production with respect to the production resources directed toward that goal. The proposed procedure for selecting modernization plan variants is, in our view, only an attempt to improve the calculations of capital investment effectiveness from the position of providing unity for the collective and national interests in the direction of raising the effectiveness of national production.

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NEW PLANNING ORIENTATION, TECHNIQUES IN THE MAKING

RSFSR Planning Tasks

Moscow SOVETSKAYA ROSSIYA in Russian 6 Sep 79 pp 1-2

[Text] The contemporary development of Soviet society is making new demands on the improvement of management and planning. This is a key problem today, as Comrade L. I. Brezhnev has repeatedly emphasized in his speeches. He said in the report to the 25th CPSU Congress: "It is primarily essential to secure a considerable improvement in planning. Ours was the first country to embark on the path of the planned direction of the economy. Dozens of other states have learned and are learning this difficult art from us. But we also are now confronted with the task of raising the level of planning work and bringing it into line with the new dimensions and appearance of our economy and the new demands of the times."

The consistency of the implementation of this policy was strikingly demonstrated in the CPSU Central Committee decree on a further improvement in the management mechanism and the tasks of the party and state organs and the joint CPSU Central Committee and USSR Council of Ministers decree "An Improvement in Planning and an Increase in the Impact of the Management Mechanism on Increased Production Efficiency and Work Quality."

Life itself has pushed to the forefront an acute problem in our republic: making the fullest and most rational use of the tremendous economic potential and securing a radical increase in production efficiency and work quality. In the 10th Five-Year Plan alone production capacity of industry in the RSFSR will have increased by the equivalent of more than 40 percent of the industrial potential created throughout the years of Soviet power. It is impossible to insure its increasingly efficient output without a further improvement in planning and management.

Considerable tasks for the realization of the party and government decisions confront the planning organs, ministries and state committees of the RSFSR and other bodies supdepartmental to the RSFSR Council of Ministers, primarily the republic Gosplan. The RSFSR Gosplan has to perform a great deal of work on an improvement in centralized planning, the introduction of the

planned measures of an improvement in economic levers and incentives and on the increased coordination of the activity of the RSFSR ministries and departments, autonomous republic councils of ministers and krayispolkoms and oblispolkoms.

A number of important measures envisaged by the decrees has to be implemented in the 10th Five-Year Plan. Thus in the period 1979-1980 it is necessary for the ministries and departments to compile certificates for each association and enterprise and to amplify them subsequently. The data of these certificates describing the availability and extent of utilization of production capital, the engineering standard and other technical-economic indicators will help raise the scientific level of planning work.

It is also very important that a new procedure is being determined for the elaboration of balance sheets of material resources. Balances for a consolidated product list and also plans of their distribution will be compiled and recorded in the five-year quotas for the first time. This will afford an opportunity of eliciting in good time the bottlenecks in catering for the economy's need for individual products and outlining measures to overcome them. The elaboration of territorial balances will make it possible to more correctly solve questions of the location of production forces on the republic's territory and also determine an optimum schedule of bulk freight traffic flows.

Success will also depend on the elaboration of a unified scientifically substantiated system of norms and standards which must reflect the achievements of science and technology and the contemporary level of the organization of labor and production. The preparation of a normative base will require a great deal of painstaking work and the solution of numerous organizational and procedural questions.

The elaboration of programs of the creation and introduction of new equipment is of great significance for an improvement in the content of the plans. This demands a considerable increase in the role of the RSFSR Gosplan in the use of the scientific-technical potential which has taken shape on the republic's territory and an intensification of the interaction and relations of the scientific research institutes with the enterprises. A most important part must be played by the USSR Academy of Sciences Siberian Department, departments of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, the scientific association of the RSFSR Ministry of Higher and Secondary Specialized Education and the USSR Academy of Medical Sciences Siberian Department, which are centers of the development of science and technology in the main regions and sectors of the RSFSR economy.

The RSFSR oblasts and krays have a developed network of economic institutes of the RSFSR Ministry of Higher and Secondary Specialized Education, institutes of agricultural economics of the All-Russian Association of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, zonal institutes

of the RSFSR Gosstroy, scientific research laboratories of economics and industrial production, scientific centers and their institutes, economic institutes of the USSR Academy of Sciences and so forth. Our task is to enlist more extensively skilled scientific workers in the planning of scientific-technical progress.

The decree determined a system of indicators and economic norms of the five-year plans (with an annual breakdown) for industrial ministries, associations and enterprises which to a large extent reflect the plans' orientation toward an increase in production efficiency and labor productivity and an improvement in product quality. The transition to the indicator of (normative) net product will be effected as the corresponding sectors are prepared for this. Even now it is being used experimentally for planning an evaluation of production-economic activity at almost 200 enterprises of RSFSR ministries and departments. The growth of labor productivity, the wage norm per ruble of output and also targets for a reduction in manual labor, which is of particular significance for the economy of the RSFSR since the level of mechanization at enterprises of certain RSFSR ministries is still low, will be planned. More than one-half of all workers at enterprises of the RSFSR Ministry of Meat and Dairy Industry, Ministry of Food Industry and Ministry of Local Industry, for example, are employed in manual labor.

An important place is also assigned questions of an improvement in territorial planning and its rational combination with the sectorial principle of management and primarily for the best use of labor and natural resources, nature conservation, development of interconnected production facilities and the production infrastructure and an increase in the living standard and the level of services for the public. The bulk of the responsibility for coordination of the activity of different ministries and departments on the territory of the RSFSR and for insuring its comprehensive economic and social development lies with the RSFSR Gosplan, the republic ministries and departments, the autonomous republic councils of ministers and the krayispolkoms and oblispolkoms and their planning organs.

The rational location of industry is important. A special interdepartmental commission operates under the auspices of the RSFSR Gosplan which in the 3 years of its work has examined 1,083 proposals concerning the location of industrial enterprises. Small and medium-sized cities accounted for 58 percent of these, while the proportion of big and major cities is systematically diminishing.

The huge scale of social production is making a linkup in the development of related production facilities and the creation of a unified system of the production infrastructure on the territory particularly necessary. This demands the elaboration and implementation of regional comprehensive programs which make it possible to concentrate resources on the solution of the most important economic tasks.

As of 1980 the target programs will become a most important component of the state and long-term plans of economic and social development. Right in the immediate future the RSFSR Gosplan and the ministries and departments must join in the elaboration of such all-state programs as the development of the Baykal-Amur Main Railroad zone, the saving of fuel and metal, a reduction in the use of manual labor and an increase in consumer goods production. Questions of the planning of the territorial-production complexes, in accordance with which it is planned to develop the formation outlines and capital construction plans and the main indicators of economic and social development (for the eastern regions), are being posed anew. This is making increased demands on the RSFSR Gosplan, the ministries whose enterprises are part of the territorial-production complex and the local, party and management organs of the autonomous republics, krais and oblasts where the said complexes are located.

Social questions play an increasingly important part under modern conditions. This demands a considerable intensification of work primarily in the localities, where, together with the local planning commissions, it is essential to also enlist other organizations in the compilation of consolidated plans for increasing the workers' skills and the general educational and cultural level of the population and improving housing and cultural-social living conditions, medical services and other measures in the sphere of social development.

Questions of capital construction will have to be solved anew. There is a change in the very approach to the use of capital investments in order to insure the planning of current production and of new construction as a unified whole. A new procedure of planning the work of the organizations is being introduced. As of the 11th Five-Year Plan it is planned to approve for the ministries and departments engaged in construction and installation work in five-year plans with an annual quota breakdown the commissioning of production capacities and facilities, including an increase in capacity thanks to the retooling and modernization of operating enterprises and to general and individual commodity construction output. The economic activity of the construction and installation organizations and also their economic stimulation should now be evaluated on the results of fulfillment of the quotas for the commissioning of production capacity and facilities, commodity construction output and the growth of labor productivity and profit. The RSFSR ministries and departments with construction organizations have to formulate and implement measures providing for the transition to a two- and three-tier system of management in the period 1979-1981.

A most important direction of an improvement in the management mechanism is a further improvement in the methods of the economic stimulation of social production and the increased efficacy of economic levers and incentives. The task is to make material encouragement directly dependent on the efficiency and quality of work, the fulfillment of plan quotas and the results of production activity.

An improvement in economic levers and incentives should be an important reserve of an increase in production efficiency not only in the fulfillment but also in the elaboration of the plans. This will be expressed throughout the procedural documentation on planning. What is required is the precise coordination of the work of the RSFSR ministries and departments on insuring the comprehensive application of all the new regulations of the management mechanism in the 11th Five-Year Plan.

In the next 2-3 years we are confronted with completing the formation of production associations as the basic financially autonomous element of industry and also continuing to improve the financially autonomous methods of the work of the republic industrial associations. There are currently 1,000 production associations in RSFSR industry. Their work results testify to the unutilized reserves in this progressive form of the basic tier of management. The creation of the republic industrial associations contributed to bringing management in the middle tier into direct proximity with production and reliving the top tier (the ministry) of certain day-to-day and operational functions.

The scale and complexity of the work to be done to improve planning and management require particular purposefulness and persistence. It must be made very clear: vacillation, sluggishness and playing safe are no less harmful in the reorganization that has begun than undue haste and aimless bustle. It is also important to remember in carrying out this work that an improvement in the economic mechanism is being undertaken on the move, under conditions where a strenuous struggle is underway for fulfillment of the quotas and socialist pledges of the 10th Five-Year Plan, where the present year has confronted us with many difficult problems and where the elaboration of the plan of the RSFSR's economic and social development in 1980, which crowns the 10th Five-Year Plan, is being completed.

A meeting of the party aktiv was held recently in the RSFSR Gosplan which discussed the communists' tasks to fulfill the CPSU Central Committee and USSR Council of Ministers decree "An Improvement in Planning and an Increase in the Impact of the Management Mechanism on Increased Production Efficiency and Work Quality."

The RSFSR Gosplan communists were set the task of drawing up the draft of the 11th Five-Year Plan and the main directions of the republic's economic and social development in 1980 with regard for the requirements of the party and government decrees on an improvement in planning and management.

Implementation of the measures outlined by the party and government for an improvement in planning and the entire management mechanism should be the principal direction of the activity of all planning, management and financial bodies in the center and in the localities.

Balanced Aspect of Plans

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Sep 79 p 3

[Text] Tremendous and largely unique experience of the planned development of the economy has been accumulated in our country. The very fact of the building in the USSR in a historically short time of a developed socialist society is striking testimony to the tremendous possibilities and advantages of the planned management of the economy. The leading role of state plans in socialist building is recorded in the USSR Constitution, while an improvement in planning and the increased impact of the management mechanism on all aspects of social production are acknowledged to be most important reserves of an increase in efficiency and an improvement in the quality of work in all links of the economy. As the recently adopted CPSU Central Committee and USSR Council of Ministers decree points out, the task is to raise the level of planning and management and bring them into line with the requirements of the present stage of developed socialism.

A most important direction of an improvement in all planning work and the achievement on this basis of high final economic results is that of securing a better balance of the volumes of production, capital construction and commodity material-technical resources. The application of the balance method is the best way of eliciting and maintaining definite quantitative relations and national economic proportions.

Requirements and resources are linked, expenditure and final results are commensurated, all plan quotas and indicators are correlated and coordinated, economic reserves are revealed, and the material, cost and labor ratios corresponding to the goals and tasks of the plan are determined and maintained with the help of the balance method. A number of balance sheets is being drawn up for this purpose. The material balance sheets--a basic instrument of planning--play a leading part among them. They help to determine the necessary physical-material intersectorial and intrasectorial ratios in the long-term, five-year and annual plans of economic and social development.

The system of material balances presently being formulated by the USSR Gosplan consists of material single-product balances and comprehensive balances (boiler-furnace fuel, merchant bar products, all types of pipes, timber, cable products per copper weight and so forth). A physical-cost balance of equipment has been drawn up since 1970. It makes it possible to link the resources of equipment allocated for construction with the funds for its acquisition provided for in the capital investments plan. In the preparation of the annual plans the USSR Gosplan draws up altogether material balances and distribution plans for 2,025 of the most important types of industrial and agricultural product. Some 670 of them are for raw material and fuel-energy resources, and 1,355 for machinery, equipment and components. The balances and distribution plans for 295 of the most important products are approved by the USSR Council of Ministers, the remainder by the USSR Gosplan.

These balances and distribution plans cover more than 70 percent of the value of industry's sold output. In the distribution plans material resources are allocated to 276 owners of capital. Of these, 197 are USSR ministries and departments and the union republics, 14 are main acquisition centers and 155 are individual construction projects and areas. Material resources for agriculture, capital construction and scientific research work, for sale to the public (market allocations) and the repair and operation of fixed capital and also for the fulfillment of comprehensive target programs--development of the RSFSR's non-Chernozem zone and Western Siberia and the construction of the Baykal-Amur Main Railroad, for example--are allocated in a separate paragraph.

The soyuzglavsnabsbyty and the main acquisition centers of the USSR Gosplan, USSR Ministries and departments and the union republics are performing a considerable amount of work on the distribution of material resources. But at all levels of planning it is being performed in accordance with a unified methodology and is regarded as a priority task of all planning bodies. And here also the most important thing is to assess correctly the need of sectors of the economy for this product or the other. This is done in accordance with its expenditure norms with regard for the targets for an average reduction therein and the norms of carryover stocks determined in the five-year plans. The USSR Gosplan approves, in conjunction with the USSR Gosstroy, the norms of the expenditure of materials employed in construction and, with the USSR Gosplan, the norms of the carryover stocks in the hands of the suppliers and customers and at the bases of the territorial administrations of material-technical supply. Targets are currently being formulated and approved for a reduction in the expenditure norms for 36 of the most important types of material resources. In addition, the USSR Gosplan is approving expenditure norms for electric and thermal power, oil products and boiler-furnace fuel.

The application of computers and economico-mathematical methods has opened new possibilities for an improvement in balance-sheet work. The use of computers is making it possible to gradually relieve the ministries and departments and union republics of the laborious calculations of their requirements. They are being centralized in the USSR Gosplan's Main Computer Center. Even now the machine-building sectors' requirement is determined there in accordance with individual expenditure norms for 9,500 products. But the centralization of these calculations requires of the ministries and union republics the timely preparation of progressive expenditure norms, strict discipline and responsibility in the preparation of input data on the production volumes.

Balance-sheet work is constantly being improved. A rise in the level of planning, which is rapidly becoming increasingly complex, is inconceivable without this. Take, for example, the fact of the doubling of our country's economic potential in the past 10 years. We are now the world leader in the production of steel and merchant bar products and oil and coal and are in second place in natural gas extraction. However, the consumption of these

resources is now growing more rapidly than the development of ferrous and nonferrous metallurgy and the oil, coal and gas industry. A reason for this situation is the insufficiently efficient use of ferrous and nonferrous metals and fuel-energy resources. How to solve this problem?

There are many paths and methods. These include an improvement in production engineering, the increased production of efficient types of metal and introduction of the strictest order in the preservation and use of raw and fuel-energy resources. But the main point remains a comprehensive improvement in the norm setting of their consumption and its organic fusion with the management mechanism. The CPSU Central Committee and USSR Council of Ministers decree points the planning bodies in precisely this direction.

A number of substantive measures of a fundamental nature has been outlined. In particular, the USSR Gosplan, with the participation of the ministries and departments concerned and the union republic councils of ministers, has been entrusted with formulating within 6 months a system of progressive technical-economic norms and standards for types of work and the expenditure (saving) of labor, raw materials, goods and fuel and energy and also norms of the use of production capacities and specific capital investments. A basis will thus have been created for annual material, labor and financial balances. It should be said that we already have experience of such work.

The material balances have an important role in the formulation of the five-year plans. For substantiation of the indicators of the 10th Five-Year Plan the USSR Gosplan has drawn up material balances for 234 of the most important products. Now, when the five-year plan has become the principal form of the planning of the country's economic and social development and the basis of the organization of economy activity, it will incorporate not only balance sheets for an extended list of products but also plans of its distribution among the main owners of capital. This is fundamentally new both in balance-sheet work and in planning itself.

Of course, it will be necessary to considerably reorganize the procedure of the formulation of balances and plans for the distribution of material resources and improve the study of requirements and the analysis of the use of material resources in the national economy. A great deal of work has to be done in this connection on clarifying, so to speak, the hierarchy of the product list--which balances and distribution plans will be formulated and approved by the USSR Gosplan and Gossnab, the ministries and departments and the union republic councils of ministers. It is also important to establish the upgraded measure of responsibility of the planning bodies for the plans being in balance with the resources.

Another fundamentally important point is for the plans of economic and social development to be backed up by the essential material reserves. The USSR Gosplan and USSR Gossnab have to prepare norms for these reserves within 3 months. It is necessary to make considerable changes in the formation of the balances, specify the sources of the formation of the reserves and formulate the procedure of their use.

Particular attention is now attached to territorial balances. The quality of territorial planning, the organization of fuller consideration in the plans of material and labor resources in the country's various regions and the rational location of production forces largely depend on them. In conjunction with the USSR Gosstat and with the participation of ministries and departments and the union republic councils of ministers, the USSR Gosplan has been entrusted with drawing up territorial balances of the production and distribution of the most important products. On the basis of these the transportation ministries will determine the schedules of the optimum bulk freight traffic flows.

The sure balance of the plans and their most important sections--production and capital construction with material-technical resources, effective demand with the corresponding volumes of the production of consumer goods and services for payment and financial resources with society's planned expenditure--are the main conditions of the feasibility and successful fulfillment of the plan targets. But this alone is not enough. It is essential to even more unswervingly fulfill the state plan targets and the pledges for supplies to each association, enterprise and construction organization.

Not all economic subdivisions are yet coping with this task. Enterprises of ferrous metallurgy and timber and wood processing, oil, coal, and chemical and petrochemical industry are greatly in the customers' debt. This is having a negative effect on the balanced nature of the economy and weakening the stable nature of the state plan.

The CPSU Central Committee and USSR Council of Ministers have outlined a vast program of measures aimed at a fundamental improvement in the management of the economy and increased responsibility and state discipline in all links of the national economy. Their practical implementation is a task of great economic-political significance and the concern of all planning and management bodies and each labor collective.

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CSO: 1820

GOSPLAN OFFICIAL DETAILS PURPOSE OF NEW ECONOMIC INDICATORS

Moscow SEL'SKAYA ZHIZN' in Russian 11 Sep 79 p 2

[Article by P. Paskar', first deputy chairman of the USSR Gosplan: "Improving the Management Mechanism"]

[Text] It was with a feeling of profound satisfaction that Soviet people greeted the CPSU Central Committee resolution on further improvement in the management mechanism and the tasks of the party and state organs and the CPSU Central Committee and USSR Council of Ministers decree "An Improvement in Planning and an Increase in the Impact of the Management Mechanism on Increased Production Efficiency and Work Quality."

These documents note the need to raise the level of planning and management, bring them into line with the requirements of the present stage--that of developed socialism--strive for a considerable increase in social production efficiency, an acceleration of scientific-technical progress, a growth of labor productivity and an improvement in product quality and, on this basis, insure the constant upsurge of the country's economy and the Soviet people's well-being.

The party and government decisions have elaborated a system of measures for the further improvement and strengthening of the planned direction of the economy, the development of democratic principles in production management and the labor collectives' increased creative initiative. The adopted documents target all managerial and planning activity in the direction of an increase in production efficiency and work quality, the achievement of high final economic results and the fuller satisfaction of social and personal requirements.

The decrees provide for measures to improve planning and economic incentives in capital construction and sectors of industry, including those which constitute the agrarian-industrial complex--associations and enterprises supplying agriculture with equipment and fertilizers and construction materials

and spares and also construction and a number of other organizations. The level of the economy of the kolkhozes and sovkhoses largely depends on their activity. Implementation of the planned measures will lend new impetus to the further development of the entire agrarian-industrial complex, including agriculture and the sectors catering for its industrialization and the transportation, storage and processing of the products of the fields and livestock sections.

This will contribute to the successful fulfillment of the decisions of the CPSU Central Committee July (1978) Plenum, which, as is known, adopted a comprehensive program of an upsurge in the economy of the kolkhozes and sovkhoses on the basis of the intensification of agricultural production and the reinforcement of its material-technical base. The utmost mechanization and electrification, chemicalization and land improvement--such is the foundation on which the plans of the further development of agriculture elaborated by the party are based.

In working on the strategic task of striving for the country's dependable provision with food and industry's provision with agricultural raw material, in recent years the CPSU Central Committee has formulated a whole number of concrete measures whose purpose is to make agriculture a highly developed sector of the economy. A special place among these is occupied by the CPSU Central Committee resolution "Further Development of the Specialization and Concentration of Agricultural Production on the Basis of Interfarm Cooperation and Agrarian-Industrial Integration."

This document has found support in the party and among the people. Interfarm cooperation and the intensification of kolkhoz-sovkhoz production is the most effective path of an increase in the production of agricultural products. Approximately 10,000 interfarm and agrarian-industrial enterprises and associations are currently operating in the country. This process is contributing to an acceleration of the pace of agricultural development.

One further example of work on the further improvement of the management of agricultural production is the recently adopted CPSU Central Committee and USSR Council of Ministers decree "The Creation of a Unified Specialized Agrochemical Service in the Country."

The most important areas of an improvement in all planning work are choice of the most effective paths of the achievement of high final economic results, the rational combination of sectorial and territorial development and long-term and current plans, an improvement in intersectorial and intrasectorial ratios and the balanced growth of the economy. A comprehensive solution of economic and social problems is envisaged for this purpose. It is planned to concentrate forces and resources on the fulfillment of the most important all-state programs, preventing a narrow sectorial approach. In the elaboration of plans of economic and social development it is proposed that the USSR Gosplan, ministries and departments and the union republic councils

of ministers provide for the accelerated implementation of scientific-technical discoveries and developments, the rational use of production capital and material, labor and financial resources and the correct determination of priorities in the development of the sectors and economic regions.

Measures to improve long-term planning occupy a central place in the decree. A procedure for the compilation of long-term and current plans has been laid down. It is based on the elaboration of comprehensive programs of scientific-technical progress for 20 years, the principal directions of economic and social development for 10 years and the five-year and annual plans. The chief form of planning is the five-year plan with the annual breakdown of the quotas. The fact that fulfillment of the five-year plan will be evaluated as an accumulative result from the start of the five-year plan and the evaluation of fulfillment of the annual plan as an accumulative result from the start of the year is of fundamental importance.

Much attention is paid to the normative planning method. This means, in particular, that the plans should be compiled on the basis of a system of scientifically substantiated technical-economic norms and standards for types of work, expenditure of labor, raw materials, goods and fuel-energy resources and so forth.

The proportional development of the economy is determined to a decisive extent by the balanced nature of the plans on the basis of the close linkage of all types of resources with requirements and also of the coordination of completion dates. The planned compilation of five-year balances of material and labor resources, production capacities and finances, providing for essential reserves, will contribute to this.

It is envisaged that elaboration of the annual plan will be initiated from below--the production associations, enterprises and organizations. On the basis of the spread of socialist competition and the use of internal resources the labor collectives may adopt counterplans which exceed the quotas of the five-year plan. The counterplans, which are adopted on the initiative of the production associations, enterprises and organizations and which are linked with the material resources, are incorporated in the annual plan. Here the higher the level of plan quotas assumed by the collective, the greater the possibilities of providing incentives for the workers.

Questions of an improvement in the system of providing incentives for agricultural enterprises achieving high indicators and of a further improvement in planning in agriculture were examined at the CPSU Central Committee July (1978) Plenum. Corresponding decisions were adopted in this connection. In particular, it was deemed expedient to eliminate the multiple nature of the plans of purchases of agricultural products and, as of the 11th Five-Year Plan, determine a unified taut, but feasible plan for the republics, krais, oblasts, rayons, kolkhozes and sovkhozes.

The CPSU Central Committee and USSR Council of Ministers decree proposes that the party, soviet, trade union and Komsomol organizations and the management bodies secure the active participation of the labor collectives in the development of the five-year and annual plans and in monitoring their fulfillment. It is essential to concentrate the main attention here on insuring the efficient use of production capacity and resources, increasing labor productivity, improving work and social conditions and strengthening plan, production and labor discipline.

The social orientation of the plans is being intensified. For this it is planned to incorporate therein at all operational levels general sections on an entire complex of measures in the sphere of social development. Measures to improve work conditions and enhance one's skills and professional expertise and educational level, cultural-social living conditions and medical services are included here.

There is a substantial change in the plan indicators in industry and construction. They are being put together with a view to motivating the labor collectives to struggle for an increase in labor productivity and a saving of materials and money and for the rational use of fixed capital. The new indicators include the growth of the net product (normative), which is designed to evaluate the work of the enterprise collectives more objectively. This indicator is simply calculated. Material expenditure is deducted from the value of each product calculated on the basis of comparable wholesale prices. The difference is the net product. As a result the enterprises will not now be concerned to produce heavier products through the use of, say, more expensive materials. On the contrary, with the new system of plan indicators the less the expenditure of physical assets, the greater the net product, and there will be a corresponding growth in labor productivity and payment therefor. Transition to the normative net product indicator will be effected as the corresponding sectors are prepared for its introduction.

The following, in particular, are envisaged among other indicators: the growth of labor productivity calculated from the net product, the wage norm per ruble of output a ceiling on the number of workers and employees, targets for a reduction in manual labor and the introduction of new equipment and overall profit and, in individual sectors, a reduction in the prime costs of output and others. The fulfillment of plans of supplies of products on the schedule which make it possible to take better account of the consumer properties of the products will be taken into consideration in an evaluation of the work results of the enterprises and economic incentives.

A number of new indicators is also being introduced in capital construction. Here also the activity of the labor collectives is oriented toward the achievement of high final results--the commissioning of production capacity and facilities. One of the most important new indicators is the value of construction and installation work performed at complexes and facilities ready for operation which have been handed over to the client and which are

completely ready to manufacture products and render services. The introduction of the settlement of accounts between clients and contractors for enterprises, complexes on the point of startup, stages and facilities which have been fully completed and handed over for operation will be completed in 1981.

The adopted decisions contain a number of interconnected measures for a further improvement in the management mechanism in construction. They are geared to an increase in the efficiency of capital investments and the acceleration of the commissioning of production capacity and projects. As of the 11th Five-Year Plan it is intended to approve a stable five-year plan of capital construction broken down by year and fully balanced with resources of goods and equipment and with labor and financial resources and also with the capacities of the construction and installation organizations.

An improvement in the management mechanism is secured by the organic unity of planning and economic stimulation. Whence the great attention which the party and government decisions devote to the further development of financial autonomy.

The purpose of financial autonomy is creative quest for the most rational paths of an increase in production efficiency and work quality, the growth of labor productivity, a reduction in production costs and an increase in profit. The decisions of the CPSU Central Committee and USSR Council of Ministers strengthen financial autonomy's link with final economic results and alter the mechanism of the distribution of profit and the formation and expenditure of the wage and economic incentive funds. The main point here is the closer linkage of bonuses and remuneration with the growth of labor productivity and the quality and supplies of products to the customers in accordance with the contracts.

A certain amount of work has been done on the development of financially autonomous relations in agriculture since the CPSU Central Committee March (1965) Plenum. Now, for example, all the sovkhozes operate on full financial autonomy. As the CPSU Central Committee July (1978) Plenum observed, in the solution of the problems of an increase in the production of agricultural products an important part is played by stable, soundly regulated economic relations in agriculture and also between sectors of the agrarian-industrial complex. The correct combination of the interests of all sides participating in the production and sale of products is a chief principle of socialist management.

Democratism in the preparation and implementation of the plans is an inalienable feature of socialist planning. Its strength and effectiveness lie in its scientific spirit and party-mindedness and in its comprehensive approach to the formulation and solution of urgent problems. The implementation of the broad package of measures to improve the operational mechanism of management and planning will insure a new upsurge of the economy and a further rise in Soviet people's living standard.

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CSO: 1820

LONG-TERM PROGRAMS FOR ECONOMIC DEVELOPMENT OF SIBERIA

Frunze SOVETSKAYA KIRGIZIYA in Russian 28 Aug 79 p 2

[Article by Academician G. Marchuk, vice president of the USSR Academy of Sciences, chairman of the USSR Academy of Sciences Siberian Department and hero of socialist labor: "The 'Siberia' Program"]

[Text] "The Earth's axis has shifted. Asia has stirred! The names of cities in the tundra or taiga, in the Altay foothills or on Baykal, in Kazakhstan or on the Caspian have as familiar ring to the younger generation as London, Paris and Berlin.... The plan is becoming as routine a document as, say, the multiplication table.... And the centers of world competition--the stock markets--are listening in horror to the clattering of the machines tapping out data on the price quotations of the metals and machine tools being produced by the industrial giants of Siberia," the French journalist Paul Vaillant-Couturier, who visited Siberia in 1929, wrote in the book "Grainfields and Oilfields."

Prophetic words! The USSR's first five-year plan was then beginning. We are currently completing the 10th. These 50 years have changed Siberia beyond recognition. Its industrial production has increased dozens of times over. In 1980 it and the Far East will provide one-half of Soviet oil and gas condensate, 40 percent of natural gas and coal, 30 percent of the timber, paper and cardboard, 20 percent of electric power....

Some people attribute the dynamism of this development, which is making an increasingly big contribution to the Soviet and world economy, to the local treasures, which, they said, virtually drop into one's hands of their own accord. Everyone remembers Siberia's gold and diamonds discovered in the 20th century. But they and other wealth have been there from time immemorial. And before they yielded themselves up to Soviet man, they had to be found and taken in the face of all difficulties.

It should be recalled that the Northern Hemisphere's extremity of cold (as much as minus 70 Centigrade) is right here in Siberia. More than two-thirds of the area (6 million square kilometers) is a permafrost zone. The West Siberian oil and gas field is also part of its domain. It is on the same latitude as Alaska and is close to it in its harsh climate. And the average yield of the wells here is approximately 200 tons of oil per day compared with the 1,000-2,000 and over 3,000 in the Near and Middle East. Whence the far greater proportional costs.

Oil was first produced here in 1959. Approximately 1 million tons were produced in 1965. Over 31 million tons were produced in 1970. This growth, despite all the difficulties, raised our hopes. Western experts were skeptical concerning the plans to produce no less than 120-125 million tons of oil here in 1975 which were approved by the 24th CPSU Congress. But we produced 148 million tons. The plan for 1980 is for over 300 million tons. The entire increase in its production in the USSR in the period 1976-1980 and almost the entire increase in natural gas and aluminum and also to a considerable extent the increase in products of the power-consuming chemical and pulp and paper sectors--such is Siberia's contribution.

Our country as a whole will increase industrial production 35-39 percent over the five-year period. Siberia will increase it 50 percent. Its development given such a pace and specific conditions (increased expenditure of forces and resources and nature's diminished capacity for recovery) should be not merely plan-oriented but particularly farsighted and comprehensively substantiated economically and ecologically. Disconnected research not subordinated to unified goals, programs and leadership could not have provided the optimum and best solutions of the entire complex of tasks.

Created in 1957, the Siberian Department of the USSR Academy of Sciences coordinates and directs efforts along the entire front of this research on the scale of a vast region, applying increasingly extensively the program-goal method of its organization. In 1978 it examined the drafts of 24 programs extending over two-three five-year plans and embracing key questions of the rational use of the minerals, land, forests and waters of Siberia and the Far East, the long-term aspects of the development of territorial-production complexes and the economic-ecological problems of the formation of new industrial regions. These are 24 parts of a single whole--the future "Siberia" Program (its exact title is "Comprehensive Development of Siberia's Natural Resources"). There follows a brief description of certain of these elaborations.

The oil and gas of Western Siberia. As L. I. Brezhnev observed in his speech at the 18th Komcomol Congress, in only 10 years we have turned this taiga region into the country's principal oil center. A powerful gas and chemical industry is now developing here. Territory of 1 million square kilometers (Britain, Spain and Italy together) is being economically developed and settled. We did not err in boldly investing huge assets. In the next 10 years Western Siberia, which already provides almost one-half of Soviet oil and a

large quantity of gas, will be responsible for the main increase in the production of these valuable types of fuel and raw material. A new, even more complex stage of the region's development has arrived. We are faced with doubling and tripling the volume of all operations here. New material-technical input and a new influx of people will be required.

The purpose of the program is to underpin this center with new mineral resources. Oil-exploration prospects in the southeast of the region have already been substantiated. It is planned to increase the efficiency of the exploration, development and operation of the deposits and oil and gas shipment over great distances. It is proposed to technologically improve the processing of the source product at the Tobol'sk and Tomsk petrochemical combines.

The extensive search for new deposits is promising not only in Western but also Eastern Siberia, although, of course, it is becoming increasingly difficult of access: it is necessary to penetrate increasingly deeply into the interior and increasingly further to the east and to the north and to even harsher, uninhabited regions. But accumulated experience permits us to hope for an assured solution of the problems in spite of all the difficulties.

The ecology and environmental protection in Siberia. Mining and processing sectors of industry are increasingly relocating here, beyond the Urals. The growing industrial impact on nature must be met by equally large-scale measures of its protection. It is planned to forecast even better the changes in the environment with regard to intensive economic development and to formulate recommendations on the optimum use of the land, forests and waters and on recultivation of the soil disturbed during the extraction of minerals. Particular attention has been paid to the elaboration of nature-conservation measures under permafrost conditions.

Here also we can rely on accumulated experience. We have compiled a number of major comprehensive programs. Certain of them are already being implemented (protection of the Lake Baykal basin and the ecologically substantiated development of the Baykal-Amur Main Railroad zone). It was with good reason that on a recent visit to the USSR Dr Saburo Ikeda of Kyoto University, an expert of the International Institute of Applied Systems Analysis, observed: "Siberia exports to Japan coal, timber metals.... The Siberians' experience in nature conservation could also, I believe, be a worthy export item. As I have seen, the USSR is implementing an effective program of environmental protection in the development of the eastern regions."

Of course, there are many problems ahead. Many of the 24 programs, which will in time be reduced to a single overall program, have only just begun to take shape. Important results have already been obtained in some, but far more needs to be done. The "Siberia" Program will come to fruition, in the main, in the next five-year plan.

Vaillant-Couturier was right when he said half a century ago that the plans are becoming as routine documents as the multiplication table. This comparison is even more apposite today: behind their figures are mathematically precise calculations embracing not one but two-three five-year plans. Comprehensive analysis of the problems, research and decisions is the basis of the comprehensive, large-scale, long-term programs which are currently determining the future of Siberia and our entire country.

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CSO: 1820

FURTHER COORDINATION WITH CENTER REQUIRED IN TERRITORIAL PLANNING

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Sep 79 p 2

[TASS interview: "Combining Rationally"]

[Text] Among the measures aimed at a further improvement in the management of the economy the CPSU Central Committee and USSR Council of Ministers resolution notes the important role of the rational combination of the sectorial and territorial development of the economy.

The work in this area was described to a TASS correspondent by Doctor of Economics V. F. Pavlenko, deputy chief of a USSR Gosplan department.

[Question] The resolution emphasizes the importance of the correct determination of priorities in the development of sectors in the economic regions. How is this task being accomplished?

[Answer] The system of so-called priority sectors and regions determines the trends and directions in the development and location of production forces on the country's territory. The significance of this approach was emphasized in the decisions of the 25th CPSU Congress and subsequent CPSU Central Committee plenums. This course is logically continued in this party Central Committee and government decree also.

The question is which sectors should be developed where and in what sequence in order to have therefrom the greatest impact and more rapidly achieve high final economic results. Social problems must be solved simultaneously here in the priority regions.

An aggregate of factors of the greatest significance is taken into consideration in determination of the priority regions. The fuel-energy factor and the availability of labor and water resources are currently among these factors.

The regions of priority assimilation and development within their concrete boundaries are determined at the next stage. The territorial-production complexes cited in the decisions of the 25th CPSU Congress are established in this way. The role of the correct solution of territorial questions increases as sectorial management develops. Such is the dialectic.

[Question] What, in your opinion, insures the most effective linkage of the forms of management essential for an acceleration of the comprehensive development of the production forces?

[Answer] In our view, closer contact between the all-union ministries and union republics. The resolution notes the need for a further intensification of the central ministries' and departments' cooperation with the union republic councils of ministers, particularly on questions of the development of territorial-production complexes. The intention is to elaborate specific-target programs--intersectorial and territorial--in the plans. The resolution instructs the USSR Gosplan to determine the list of these programs prior to the start of the next five-year plan.

A big role in an improvement in planning is assigned the territorial balance sheets being put together by the country's Gosplan. They will assist in the adoption of substantiated decisions on the construction of enterprises in this region or the other.

I would like to emphasize that the elaboration of territorial balance sheets is also the path toward the rationalization of rail shipments.

[Question] Territorial-production complexes are playing an increasingly significant part in the country's economy. What are the paths of a further improvement in their management?

[Answer] The creation of special bodies for coordinating the activity of all ministries and departments on a given territory should possibly be of particular importance in the territorial-production complexes. Fulfilling an instruction of the USSR Council of Ministers concerning an improvement in the management of territorial-production complexes, the planning organizations are studying this question. Much, primarily the successful implementation in the localities of well-balanced plans which are reliably backed up materially, will depend on its solution.

[Question] Among the specific comprehensive programs, the CPSU Central Committee and USSR Council of Ministers resolution cites, in particular, the program of the construction of the Baykal-Amur Mainline. How do the immediate development prospects of this region appear?

[Answer] In addition to the main role--that of a transportation artery--the Baykal-Amur Mainline will determine the future of the regions through which the line runs. The creation of particularly large-scale territorial-

production complexes is not being planned here as yet. An analysis shows that in this zone it is primarily essential to develop sectors of all-union specialization and also sectors designed to serve the population of the territories being developed. "Series" of relatively small local territorial-production complexes will arise in the Baykal-Amur Mainline zone in the future.

The approach to questions of territorial development and of their combination with the development of sectors envisaged in the CPSU Central Committee and USSR Council of Ministers decree rules out stereotypes and standardized solutions and reveals the most effective paths of the balanced growth of the economy of the country's developing regions.

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CSO: 1820

REVIEW OF BOOK ON OPTIMAL DEVELOPMENT, DISPOSITION OF INDUSTRY

Moscow *Ekonomika i Matematicheskiye Metody* No 5, Sep-Oct 79 pp 1031-1034

Review by V. N. Livshits of the book "Basic Methodical Conditions for Optimum Disposition and Development of Industry", Moscow, Izdatel'stvo Nauka, 1978, 271 pages/

Text Industrial planning is a sphere in which economic-mathematical methods are being used most widely and successfully in the course of the last 20 years. As a rule, when the problems and the corresponding optimized solutions for relocating and developing industry are skillfully formulated and solved, the economy resulting from their utilization comprises from 5-15 percent of total outlays, which is reckoned in billions of rubles on the national scale. This imparts to the problem of industrial optimization great national economic significance and increases the urgency for research in this direction.

The experience of many scientific and planning organizations of various industries, accumulated to the present time, underlines the urgent necessity for regulating the existing system of optimizing estimates by industries, and putting them into a normative channel, and on the basis of standardization of problems and methods for solving them: expanding the sphere of the use of economic-mathematical methods for optimum disposition and development of industry; perfecting them; and in the final analysis, sharply increasing the effectiveness of long-range industrial planning. An important step toward achieving these goals is the book under review, written by the great and exceptionally well-qualified staffs of economists at the USSR Academy of Sciences TsAMi [Central Economic-Mathematical Institute], the IE [Institute of Economics] and OPP [possibly, Department of Industrial Enterprises] of the Siberian Department of the USSR Academy of Sciences, and the SOFS [Society for Study of Productive Resources] of Gosplan USSR—organizations which are pioneers in research on industrial branch optimization, both of a scientific and a practical character—in which these research projects have received the greatest scope.

The monograph consists of an introduction, 12 chapters combined into two sections, and a conclusion.

A brief analysis of the experience in industrial branch optimization is presented in the introduction, and key questions are indicated: defining goals and criteria for industrial branch optimization; conditions and limitations of corresponding problems in mathematical extremes; selection of methods for evaluating the initial variants; requirements for a data base; analysis of solutions derived; etc. It is properly stressed that, "One must not limit oneself only to standard models and methods. Various industrial branches with a non-uniform range of articles, with complex or simple technological association, continuous or discrete, mass or serial production, etc., have their own peculiarities"; therefore, "a standard method serves as a basis for working out the procedures for a branch of industry in which the different conditions with respect to the specifics of the production under study, the industrial branch or a multi-industry complex, must be developed and made concrete." (p. 5). Here is also enumerated a number of the most important problems, the solutions to which are necessary for further success in introduction of economic-mathematical methods to the practical work of planning. Among these are, problems of expanding the horizon of planning and correlation of tasks at various levels; organizing a wider sphere of work on optimizing complexes of interconnected sectors of industry and production; establishing procedures for optimization under conditions of incomplete or undefined data in derivation of reliable variants of a draft plan for a sector; and others. It would seem useful to include in this list the following: in solving problems for optimization of a branch of industry, to account for a subsequent system of cost-accounting operations in the corresponding enterprises; and, working out methods, and research in the area of multipurpose industry optimization. Additionally, it would be useful to point out, that "the basic methodical conditions" are predetermined, for the most part, for the industrial branches in the sphere of material production.

The first section (chapters 1-3) is devoted to /standard methodical conditions of disposition and development of industry/ *[italics]*, and comprises the theoretical basis of the work. In it are the basic principles and conditions (of an economic, informational, and mathematical character) which one must include in calculations when formulating and solving the problems of optimum planning for an industrial sector, and which is common for all sectors in the sphere under study.

The first chapter—of central significance—sets forth the standard method for computations on the disposition and development of industry for the long term, utilizing economic-mathematical methods. Here the general principles are discussed, the limits and conditions for use of the procedures, their goals, the most important factors, and the criteria for optimization. A great deal of attention is devoted to discussion of the economic-mathematical models of certain standard problems, procedures for preparing the data base, and analysis of the results derived in the solution.

A very important line followed by the authors for an all-embracing system of analysis for solving industrial-branch problems of all current outlays, the results which are connected with this or that variant of disposition and development of the industry, is the orientation toward derivation of the

final results both in the current and in the average-daily plans, and in the long run. Proper stress is given to the necessity for considering the total national economic effect (and the corresponding outlays) both in the manufacturing sphere and in consumption of the products. Sequentially embracing the entire range of tasks which are encountered in the practical work of industrial-branch optimization, the work carefully delimits the sphere of use of specific criteria for optimization (a minimum of overall public outlays, a maximum of profit, the national economic effect of the manufacture and use of the products, the volume of manufacture of highly efficient, and deficit products, etc.).

While examining the basic organization of the problems—discrete, continuous, or composite—the authors devote a great deal of attention to the first of them, and discuss the suitability of statistical and dynamic models of manufacturing and manufacturing-transportation problems.

The methodical conditions which relate to preparation of the data base are very important. Coordination of the requirements of the existing system of indicators in national economic planning, envisaged in "Methodical Instructions for Working Out the State Plans for the Development of the National Economy of the USSR," these recommendations represent significant progress toward optimization of industrial branch solutions. Specifically, the instruction that, "Attention is given only to the outlays which arise anew, and which are necessary to assure output of the assigned volume of production" (p. 10), is of great significance. The majority of industrial branch instructions incorrectly recommend taking into consideration the old funds, to sum up capital investments and the incompletely-amortized part of the cost of the funds which are being liquidated, etc.

The first chapter also contains scientifically-based solutions to problems of accounting for the time factor: the normative of effectiveness of capital investments is assumed equal to the norm of discount, with the help of which all the non-coincident expenses and effects—capital investments, operating expenses, and the total dimension—are reduced to comparable forms. This method preserves an adequate sample of the real processes of the changes in all the constituent expenses during the period of establishing projects, and during their operation (often a rather long period). The authors include in the structure of future outlays, expenses for geological exploration, furnishing the industry with a work force, etc., which makes this structure sufficiently complete.

Also of great significance is the brief description of the procedure for analyzing the results of a solution. Here primary attention is devoted to verifying the adequacy of the model with respect to the real processes, to the structural and factorial stability of the optimum plan, to the use of both traditional and special economic-mathematical methods (dual estimation, parametric analysis, and others).

Thus, the method set forth in the first chapter is based on the principle positions of the theory of optimum functioning of a socialist economy, and therefore may be used for coordinated solution of many controversial questions. This is indisputably the great virtue of the work. Nevertheless, the problems of prices used in optimized industrial-branch estimates are not sufficiently studied. Specifically, instructions are lacking for calculations of their

dynamic (especially for labor and natural resources), on the dependence in a number of cases on varying parameters of industrial-branch optimization; and the question of the connection of the price structure with the demand of interbranch capital investments, and others, are neglected.

The economic models introduced in this chapter are oversimplified (1.3), whereas certain actual conditions on which they are based are not even mentioned. For example, an idealistic hypothesis was derived on a priori knowledge of the level of use of capacities (or the coincidence of capacity and output); in the contrasting circumstance such parameters of the model as production costs in static and in dynamic circumstances, and others, cannot be exogenously introduced in the model. It is not clear, for example, what the quantity p_T^F signifies, and why it is introduced in the condition (1.3).

Possi. It would have been more useful for all the material pertaining to the economic-mathematical model to have been concentrated in the second chapter, which was itself designated for that purpose.

and finally, certain conditions are controversial. Among these are the recommendation for accounting (and not accounting) for renovating deductions for operating enterprises (p.16), and confirmation of the fact that, "economic-mathematical calculations on optimizing the development and disposition of industry give the appropriate effect only in cases in which a sufficiently reliable and qualitative data base is used for them" (p.15), and others.

The second chapter examines the basic recommended types of economic-mathematical models for optimizing the development and disposition of industry: single-product, multi-product and multi-branch industrial and industrial-transportation, a static and dynamic organization, with discrete and constant variables. Basic attention is given to linear models on minimum outlays in a matrical arrangement, with discrete variables (although there are separate fragments on reticular arrangement and solution of industrial-branch problems with the criterion of maximum profit). Thus, the spectrum of models studied is sufficiently broad. I think that it would make sense to add only hybrid multi-level models which combine the matrical and reticular models at various levels, well-developed by the IL and the OIP of the Siberian Department of the USSR Academy of Sciences.

The instruction on page 24 is very important, that where incomplete utilization of standard capacities is permitted, it is necessary to take into consideration the reduction of outlays caused thereby. The modification of the specific function introduced thereby (II.1.a.) introduces necessary—and, in our opinion, in a number of cases—essential corrections to the models normally used. Unfortunately, no attention is given to this, and in the following chapters as in the first, the models are prepared for the most part without calculating the degree of utilization of capacities. Meanwhile, in industrial-transportation problems with fixed demand, complete utilization of capacities at all facilities takes place either by chance or only under special circumstances (or else, more products will be manufactured than are needed).

Concerning the models introduced, there are only a few remarks. Thus, it is hardly appropriate that there are many quantities here similar to those cited in the first chapter, but which are defined differently. For example, the

Boolean variable in the first chapter x_j^r is shown as x_j^q in the second, while in it x_j^q (with concrete j , r and q , this is exactly the same as x_j^r) already serves as the expression for production costs in point r with the variant q (in the first chapter the quantity c_j^r is used for these). In many other parts there is also no uniformity of definitions.

Certain areas of unclarity and inaccuracy (evidently misprints) are encountered in the lists of formulae: there should be a sign of reciprocity in the last inequality on page 29. And it would be appropriate to determine how resource limitations are assigned in the dynamic: by cumulative totals or according to definite years (in II.51 and others), and could one in this case exogenously assign the corresponding normative of outlays?

In the third chapter questions of the economic evaluation of planned variants are examined; here, the methods of calculating capital outlays and the weighted average indicators for the period of outlays, for single and multi-period management, are discussed on the basis of principle conditions presented in the first chapter.

The authors analyze variants of computing integral outlays, corresponding to the various means of mutual correlation in the dynamic of the chronologically sequential conditions at one and the same facility, by means of the model: 1) of constant variants which describe activity in the course of the entire planning (estimating) period; and 2) variants which pertain to different segments of many years study, or according to the years in the period. In addition, a great deal of attention is devoted to the corrections of the use in certain conditions of well-known estimating formulae (including those introduced in the first chapter), the use of correlation in the dynamic, for additional limitations which ought to be introduced to the model and in the procedure for preparing the economic data base.

The advantage of using statistically weighted average indicators with discount for both nonsynchronous outlays as well as for production, is correctly demonstrated. This advantage is manifested in the greater stability of such indicators as compared with others derived from formulae III-4 and III-5. Additionally, use of the given indicators assure derivation of the correct quantity of the integral sum of outlays. The condition put forth by the authors on the statement, that upon evaluation of expenditures for the period it is not appropriate to include renovating deductions in current operating costs is important, since capital investments are already completely accounted for (the analogy with credit presented for explanation is sufficiently clear and convincing).

But there are also some comments on the third chapter. Thus, it is not clear why on page 34 a detailed explanation is given for the procedure for determining restoration cost for fixed capital, which is already built at the beginning of the planning period. After all, as was indicated earlier, one must consider only future expenses (that is, those which have not yet occurred).

It would seem useful to add a system of formulae for estimating dynamic statistically-weighted average indicators, such as of their modifications, when the immediate amount of net outlays for operating, and the normative cost of capital investments (temporary-use estimates), stand in the numerator.

The lengthy algebraic derivations of formulae in III-23 and III-25 in §3.5 is hardly necessary, the more so since it is presented inaccurately (In the numerator of III-16, the c_1 is missing; in III-22 and III-23, instead of A_{1t} and A_1 , there stand the quantities x_{1t} and x_1 , etc.). And there are some misprints in expressions III-25 and III-27.

On the whole, the material in this chapter creates a sufficiently complete impression of the effective and practically realizable means of formulating the specific functions in dynamic problems of industrial-branch optimization.

The standard methodical conditions of the first section of the book are intrinsically supplemented in the second, which is devoted to the methodical conditions for optimizing the development and disposition of separate sectors of industry (chapters 4-12). Here, based on concrete examples of a number of the most important sectors of industrial production (coal, in the fourth chapter; oil drilling, in the fifth; oil refining, in the sixth; the chemical industry, in the seventh; ferrous metals in the eighth; electrical engineering, and electrical energy in the ninth and tenth; the forestry complex, in the 11th; and agriculture, in the 12th). And it is shown how the statement in the first section, of the standard positions for economic-mathematic simulation of the optimization of industrial branches, must be supplemented with concrete elements. Thus, in the fourth chapter, for the coal industry, a system of models is constructed, whose components represent the problems of optimizing the development and disposition of the mining and processing of coal for energy and coal for coking (whereas the latter is solved on the basis of a bi-level approach); in the ninth, for optimizing the development, disposition and specialization of production in the electrical engineering industry, a system of models is introduced for the electrical engineering complex (for the nation as a whole and in a territorial cross-section, with its separate industrial branches), for the cable industry, and so forth.

It is convenient, that the composition of all chapters in the second section is standard and includes, as a rule: posing the problem (with the specific conditions of optimization); description of the economic-mathematical model of the sector under study (or of a corresponding system of models and interworking by its components); procedures for preparing the data base and analysis of the practical experience of solving problems of optimizing development and disposition of production within a sector.

In order to make the instructions for the economic-mathematical cycle "complete", further exposition and algorithms formulated in the process of optimizing problems of extremes are needed; but evidently these questions must be put forth in a separate volume, since they are basically presented for other users (and above all, mathematicians).

The presence of certain shortcomings notwithstanding (imprecise descriptions of the procedures for linear approximation in the fourth chapter, and others), the second section successfully fulfills its basic function—presentation of the procedural peculiarities of posing and simulating problems for optimization in concrete sectors of industry.

In the conclusion, the basic directions for perfecting methods for industrial-branch optimization are more broadly discussed, and the necessity for their direct application in the automatic systems for control and planned estimates, which are being developed and introduced at the present time.

It seems that the yield of the present "basic methodical conditions" signifies the start of a new stage of higher scientific basis and greater effectiveness in plans for the disposition and development of industry. It is difficult to overstate the significance of the work under review here, on the theory and practice of industrial branch optimization.

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IMPORTANCE OF JOINTLY SOLVING PROBLEMS OF REGIONAL, INDUSTRIAL OPTIMIZATION

Moscow *INGENIERA I MATEMATICHESKIYE METODY* in Russian No 5 Sep-Oct 79
pp 1014-1016

/Article by V.N. Churashev of Novosibirsk, "The Experience of Jointly Optimizing Plans for Development of the Southern Yakutiya Regional Industrial Complex and the Mining of Coking Coal in the Nation", under the rubric Letters and Comments/

/Text/ On a comparatively small territory in Southern Yakutiya, there have been found mineral deposits and manifestations of such mineral resources as bituminous coal, apatite, iron ore, micaceous phlogopite, gold, rare-earth elements, polymetallic ores, and others. Until recently, their introduction into the national economic turnover has been delayed because of the lack of reliable transportation connections with the inhabited areas. But the construction of the Baykal-Amur Magistral' (BAM) means the beginning of practical measures for developing the resources of Southern Yakutiya.

The presence of enormous reserves of various mineral resources in a comparatively convenient economic-geographic position (the center of the BAM zone of economic development) permits establishing in Southern Yakutiya a huge multi-industrial territorial industrial complex (TIK), which will have great significance in the inter-regional division of labor. But above all, it is necessary to develop the economically-proven composition of its economy and the most rational scales for the development of separate industries. One cannot derive answers to these problems at the level of the region itself, since the isolated studies of a regional plan of the structure of the economy found in the process, can turn out to be ineffective from the point of view of inter-regional division of labor.

Sectorial estimates (balanced or optimized) are also inadequate for determining an expedient scale for the development of the region's industries. From the position of a separate industry it is not possible to determine the economic consequences for other industries which would result from a decision to relocate production in a given area. On the one hand, in the area as a whole additional outlays may be required in connection with diverting limited multipurpose local resources; and on the other, the effectiveness of developing the area might require more complete utilization of labor and natural resources, industrial cooperation among the enterprises of various industries, and joint operation of construction facilities and objectives in the infrastructure.

Insofar as total regional outlays are correlated with those for industry in newly-developed areas, of which Southern Yakutiya is one, it is necessary to propose that accounting for intraregional factors while optimizing the distribution and development of separate industrial branches can influence their status of plans. Solution of this problem appears to be possible on the basis of the approach which utilizes an iterative process of inter-connected optimization at the branch and at the regional level.

According to the given model, in order to determine the industrial load of the Southern Yakutiya TRK, the industrial-branch problems of those manufacturers whose production can be entered into inter-regional trade, must be solved. Analysis of the potential capabilities for development of separate branches of the economy of the region under study shows that problems for the ferrous metals, coal and other sectors of the mining industry within the region should embrace the entire nation; for the electrical energy and construction industries can limit themselves to the URS's zone of economic development. But for choice in the variant of providing the population of Southern Yakutiya with perishable and hard-to-transport foodstuffs, it is sufficient to compare local production with their being supplied from the contiguous regions of Amurskaya Oblast.

In principle, all of these problems are realizable, and there is experience in the practical work of solving problems of optimization in ferrous metallurgy⁴; in the coal industry⁵; in sectors of the mineral extraction complex⁶; in electrical energy⁵; in the construction materials industry⁶; and others. Experience has also been accumulated in optimization of the spatial structure of regional-industrial combinations of various ranks, industrial centers, TRK's, and economic regions⁷. Unfortunately, lack of information did not permit carrying out complete calculations according to the model presented for coordinating industrial branch and regional solutions. Practically speaking, only one region—Southern Yakutiya, and only one branch—the coal industry, have accomplished joint optimization. The aggregate dynamic multi-product production and transportation problem for determining the total volumes of extraction and coking coal according to the key years of the planning period, in the cross-section of coal fields, derived from the requirements of separate large consumers of coal in various grades, was solved for this branch as a whole with minimal integral outlays for the mining, processing and transportation. The economic-mathematical formulation of the problem basically corresponds to that stated in footnote 3, although the objects of planning are not the coal fields but the groups of enterprises in each coal field, which are mining a certain single grade of coal. This leads to a certain increase in the dimensions of the problem (for the most part by virtue of growth in the number of variables), but maneuverability increases significantly in defining the plan for mining coal for a given coal field. Since the number of coal mining enterprises which can be built in the coal fields of Southern Yakutiya is not great, it is represented in the resources portion of the task by separate enterprise. Consumers are the coal-tar chemical industry of metallurgical plants, and the transportation centers through which the removal of the coking coal is accomplished (the possibility of supplying coal from Southern Yakutiya for export, and for the plants of Siberia and the Far East, is under study).

Optimizing the formation of the Southern Yakutiya TRK took place with the aid of the model developed under the leadership of L. M. Sevast'yanov¹. The characteristic feature of similar models is the use of two kinds of equations, balances and resource limitations for describing the ties among all the elements in the economy of a TRK, and production of the infrastructure and of local resources.

The model for optimizing the formation of the Southern Yakutiya TRK was built on the proposition that in the long run the composition, scales and dynamic of development for possible branches of specialization—ferrous metallurgy, iron ore, coal, aluminum, gold mining, and the mining and chemical industry—are defined in branch problems. In the regional model the so-called "constant" variants are assigned for the facilities of these industrial branches, embracing all the developmental periods of the complex which have been examined. For each period the demand for various types of resources, production and services, and the level of discounted outlays on the whole, have been established, according to volume.

For facilities of such branches as the construction materials industry, and industries which are called upon to provide the local population with foodstuffs, cultural and recreational goods, etc., the development of which is determined according to local demands, there are certain principles of organization of their means of operation, in economically permissible intervals.

The plan for the formation of the Southern Yakutiya TRK has been drawn up on the basis of study of the model for disposition and development of local industrial facilities at the stage of development of a complex which assures (taking into account factors of special organization of production and the services sphere) fulfillment of the task for output of production of the specialized sector, with minimum outlays for construction and operation of all the elements of the TRK's economy, while observing the needs of the standard of living of the population.

Insofar as coordination of development plans concern only one branch and one region; naturally, correction of the procedure for exchanging information between the branch and the regional models was required. In the process of optimizing the formation of the Southern Yakutiya TRK it is not possible to set up the right proportion for limitations while deriving the assignment for production which enters into inter-regional trade, and the limits of economic resources, from the solutions of branch problems.

The model for calculations of joint optimization of the development of the coal industry and the Southern Yakutiya TRK, which changes in accordance with the available data, has the following appearance:

1. The aggregate problem for optimizing the disposition and development of coking coal is solved for the long term. Variants of the development of coal-mining facilities are characterized by outlays for the mining and refining of the coal as well as for the facilities of general regional importance—construction facilities and the housing and cultural-consumer services industry. At the first step of the process these outlays are calculated on the basis of the branch norms. The volume of coal mined in the nation's coal fields, which includes Southern Yakutiya, is determined from the solution of branch problems.

2. The formation of the Southern Yakutiya TPK is optimized on the basis of the values found for coal mining and the proposals relative to the development of facilities in other sectors of specialization. Results of the solution of these problems determining, specifically, the development and disposition of facilities in the construction industry and the social-consumer services infrastructure, and the necessary outlays for this.

On the basis of the proportion of the number of workers in the coal industry and the total number of workers in the group of industries, the production of which enters into inter-regional trade, are found the outlays for the social-domestic services infrastructure, which falls to the portion of the coal industry. The volume of construction and installation work in the coal industry and in the corresponding portion of the infrastructure is the basis for calculating outlays for the development of the construction complex of Southern Yakutiya, being attributed to the account of the coal industry. In consideration of the data derived, the indicators for outlays are corrected, according to the variants of the development of the coal mining facilities of the Southern Yakutiya coal fields in the industrial-sector problem.

3. Using the corrected indicators for outlays, the branch problem is solved, and new assignments for mining the Southern Yakutiya coal are determined.

4. With the adjusted assignments for the development of the coal industry, the regional problem is solved and the new allotment of general-regional outlays between specialized branches is found and the indicators for outlays are corrected in accordance with the variants for developing the coal-mining facilities of Southern Yakutiya, and the refined data is once again transferred to the industrial-sector problem.

The iterative process continues until stable results are derived in the industrial-sector problem.

On the basis of various proposals on locations for disposition of industry, and on the terms for construction and scales of industrial development, according to which the branch problems were not solved, a series of variant calculations for joint optimization of the development of the Southern Yakutiya TPK and the mining of coking coal across the nation was introduced. It showed that consideration of intra-complex ties on the development of construction industry facilities and of the social-consumer services infrastructure during definition of the scales of development of the coal industry in Southern Yakutiya reduced to a significant degree the outlays of a general nature in this pioneer industry. Additionally, from the position of the entire coal industry it is rational to significantly increase the industrial load in the Southern Yakutiya coal fields. This conclusion testifies to the importance of accounting for intraregional, inter-industry ties during the optimization of the development and disposition of the separate industrial branches.

The data base for solution of the regional and the branch problems was prepared jointly with the Department of Economics of the Yakutsk Branch of the Siberian Department of the USSR Academy of Sciences. The dimensions of the branch problem was 290 equations with 630 variables, and in the regional problem 530 and 1,600, respectively.

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MODELING OF REGIONAL PRODUCTION COMPLEXES

Moscow *EKONOMIKA I MATEMATICHESKIYE METODY* in Russian No 5 Sep-Oct 79 pp 924-939

[Article by M. K. Bandman and N. I. Larina, Novosibirsk: "Modeling of Regional Production Complexes"]

[Text] Regional production complexes are an efficient form of spatial organization of productive forces. However, there is no uniform understanding in scientific literature of the essence of regional production complexes, the purposes for creating them and the conditions for their functioning. There is discussion underway concerning the term "regional production (or production regional) complex" and concerning the definition of its composition.

One more numerous group of specialists holds to a concept of complexes according to which only objects of the sectors of material production belong to the ranks of regional production complexes and according to which the impact of complexes is determined by virtue of an improvement in production activity. Among them, the definition given by N. N. Kolosovskiy is acknowledged as classic:

"That economic and mutually conditioned combination of enterprises at one industrial point or in an entire region, in connection with which a definite economic impact is achieved by virtue of a successful planning selection of enterprises in keeping with the natural and economic conditions of the region and with its transport and economic-geographical position, is called a production complex"

[1, p. 138]. Some differences of opinion among representatives of this group of scholars are connected with either the inclusion in or exclusion from the structure of regional production complexes of elements of the infrastructure and with consideration of all objects in the sphere of material production or only those relating to the sectors of specialization.

Another group views complexes in a more expanded structure and, in accordance with this, increases the number of items in the impact from them. These specialists include objects of the nonproductive sphere alongside objects from the sphere of material production among the elements of regional production complexes. It is probable the time has come to speak of two, although close, nevertheless different types of territorial organization of the economy and of

two different types of regional production complexes [2], to wit: (1) as forms for the organization of the material and technical base of any taxonomic unit of the economic and administrative division of the country (let us call them "traditional" regional production complexes); the type of complex in question has won recognition, beginning with the first works on the creation of economic regions and on the administrative-territorial division of the country, and has gradually made its way into the practice of regional planning; (2) as forms for the spatial organization of productive forces when putting regional programs of a certain type and class into effect within the framework of solution of major national economic problems (let us call them "program-special purpose" regional production complexes); this type of regional production complex has become widespread during the past 30 years and was designated at the 14th and 15th CPSU congresses as a form for the organization of productive forces.

Despite the fact that one and the same principle of integrated combinations (proportionality) in the formation of the component parts and that one and the same initial base—the social and regional division of labor—lie at the base of both types of regional production complexes, they are distinguished: (1) by the purpose for which they were created, by their functions in the regional division of labor and by their position in the system of planning and management of the country's national economy; (2) by the sources for heightening efficiency as a form for the spatial organization of the country's national economy; (3) by the nature of the formation in time and in space of ties with the territory and borders of the administrative-territorial units.

A large number of publications have been devoted to the problems of regional production complexes (see, for instance, [3-5]). They have revealed the sources and stages of formation of the theory of regional production complexes and its link with the over-all theory of siting and spatial organization of productive forces, with the creation of economic regions and with the administrative and territorial division. Soviet literature has discussed extensively the problems of forecasting the development of regional production complexes and has analyzed the process of formation of complexes in different regions of the country. However, a large portion of the publications (particularly those with a theoretical content) have been devoted to "traditional" regional production complexes and have still not properly reflected the gradual formation of the new type of complexes—namely, program-special purpose complexes.

In the works of the Institute of Economics and the OPP [Division of Industrial Enterprises?] of the Siberian Department of the USSR Academy of Sciences, program-special purpose regional production complexes imply the aggregate of firmly interrelated objects of sectors of the national economy (of the sphere of material production and the nonproductive sphere), manpower and natural resources, which is being created in a planned manner and is developing proportionately, and which:

is formed and functions for the purpose of joint solution of a definite class and type of national economic problems;

is concentrated on a relatively limited and, to be sure, compact (non-separated) territory, possessing a collection of resources and amounts thereof adequate for the solution of major national economic problems;

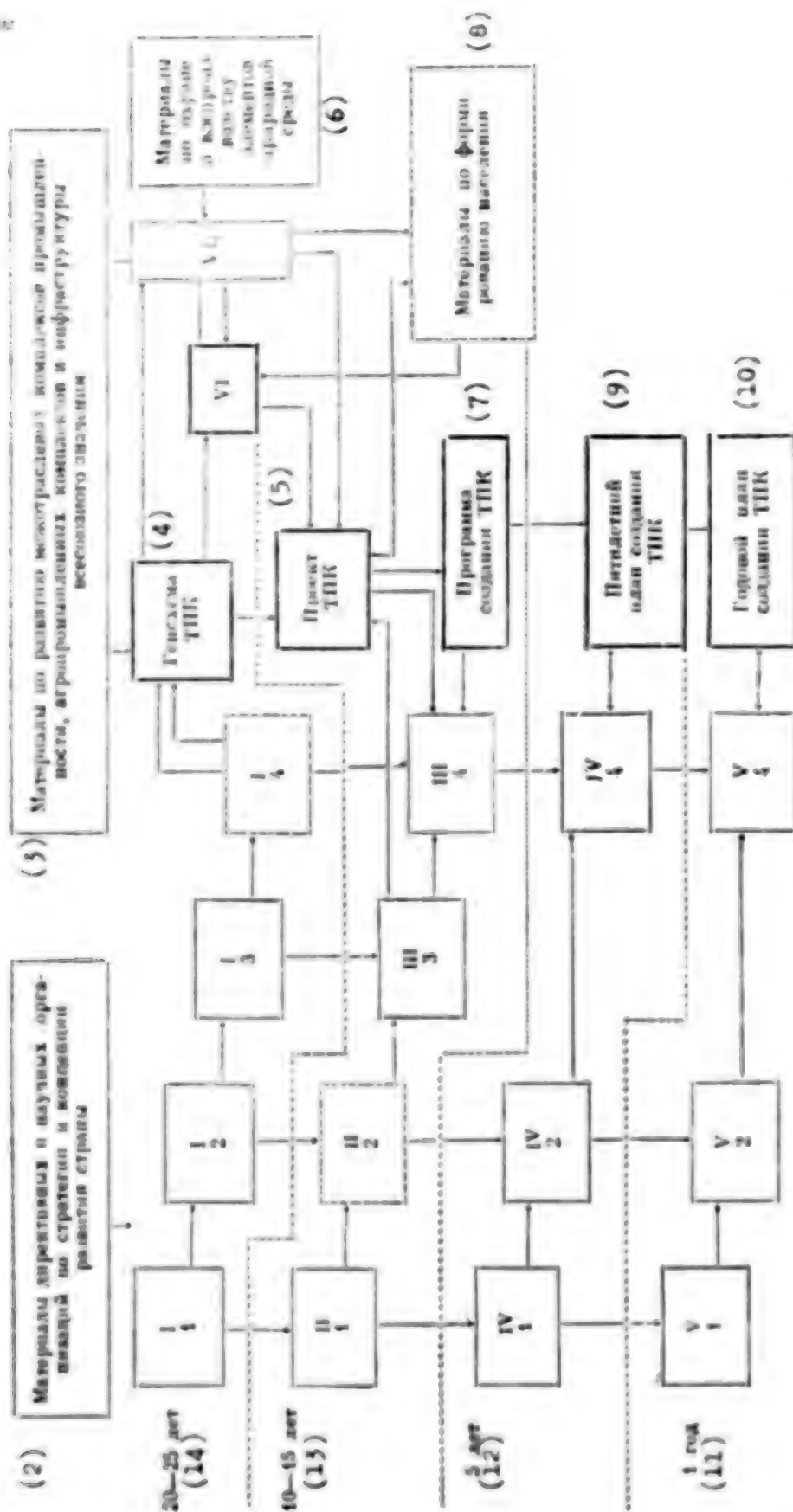
ensures not only the efficient (from the point of view of the national economy) utilization of resources, but also the protection of the environment and reproduction of natural resources;

is served by a single system of infrastructure, the structure and level of development of which corresponds to the requirements of all sectors of the economy of the regional production complex and provides for the creation of the living conditions that have been planned for the populace [6, 7].

The basic features of program-special purpose regional production complexes as forms for the spatial organization of productive forces in the solution of problems of importance to the national economy and to the region and the classification by type of these problems are set forth in [2]. It is possible to name several types of problems with which situations that give birth to the formation of regional production complexes are connected:

- a). intensive drawing into operational turnover of resources of regions being newly developed (Sredne-Ob'skiy [Central Ob'] Regional Production Complex, etc.);
- b). intensive utilization of the resources or other economic potentials of poorly developed regions, which leads to an alteration in principle in the place of the region in question in the country's national economy, in the level of development of productive forces and in the structure of the economy (the Sayanskiy, Pavlodaro-Ekibastuzskiy [Pavlodar-Ekibastuz] regional production complexes, etc.);
- c). the rapid development of new production lines within the limits of developed regions, as a result of which a new sector of specialization emerges while retaining those that have already taken shape (the regional production complex on the base of the Kursk Magnetic Anomaly);
- d). intensive modernization of the economy along with a high level of development of the region, in which, while retaining the specialization that has already taken shape, the technical and organizational level of the development of the economic unit rises sharply (the Leningrad Regional Production Complex and, in the long term, the Kuznetsk Coal Basin Regional Production Complex, etc.).

In working out an approach to the modeling of program-special purpose regional production complexes and to optimizing the production and spatial structure



(1) Система управления развитием и планирование документов ТПК и их место в системе документов перспективного планирования страны

Diagram One

- Key:
1. Basic pre-planning and planning documents for regional production complexes and their place in the system of documents for long-range planning for the country
 2. Materials of directive and scientific organizations on the strategy for and concept of the country's development
 3. Materials of All-Union importance on the development of intersectorial complexes for industry, of agro-industrial complexes and the infrastructure
 4. Master model for the regional production complex
 5. Draft of the regional production complex
 6. Materials on the protection and reproduction of elements of the natural environment
 7. Program for the creation of the regional production complex
 8. Materials on the forming of the population
 9. Five-year plan for the creation of the regional production complex
 10. Annual plan for the creation of the regional production complex
 11. One year
 12. 5 years
 13. 10-15 years
 14. 20-25 years

Explanation of Diagram One

- Documents:
- I. Master models for the development and siting of productive forces
 - II. Basic directions in economic and social development for the long-term perspective
 - III. Programs for the realization of individual national economic problems
 - IV. & V. Basic indicators for the development of the national economy
 - VI. Models for regional lay-out
 - VII. Models for the protection of the natural environment, for the utilization of lands, for the development of individual elements of the economy, etc. encompassing all or a portion of the territory of the regional production complex

- Territorial Units:
1. USSR
 2. Union republics
 3. Economic regions
 4. Oblasts (krays)

The squares made up of fine little lines represent documents being drafted for all objects for forecasting and planning; those consisting of bold-face lines represent documents which must be worked out for each program-special purpose regional production complex, while those consisting of italics represent those being drafted, but not in terms of all units of the respective class. The arrows represent the basic directions of the flows of initial information.

and the process of their formation, we have proceeded on the basis of the fact that the size of the complex, the specialization, the scope, rate and the time for formation of complexes are determined by a specific national economic problem. Regional production complexes are the result of a one-time, although prolonged (15 to 20 years), action of the state. The period of functioning of program-special purpose regional production complexes as a specific form for the organization of productive forces corresponds to the time for realization of the program for the creation of the material and technical base necessary for the solution of the specific problem. In connection with this, a corresponding system of pre-planning documents (Diagram One) and administrative organs [8-10] is necessary to regulate the process of formation of regional production complexes.

The siting of program-special purpose regional production complexes is determined by the geography of the sources of the resources necessary for the solution of the specific national economic problem. The borders of such complexes may coincide or not coincide with the borders of the corresponding administrative-territorial units. The structure of the program-special purpose regional production complexes has been conditioned by the tasks in the formation of the material and technical base and in ensuring standardized conditions for the functioning of all objects connected with the solution of the corresponding problem. The objects of the sphere of material production and of the nonproductive sphere, natural resources and the population are the basic elements of regional production complexes. The presence of bilateral interrelationships both among the individual elements of the regional production complex, as well as with the external socio-economic and natural environment, is assumed.

The greatest influence on the selection of the set of tools for research on the regional production complex as an object of modeling has been exerted by traits common to all types of complexes: 1). the complexity of the internal structure (both in terms of composition, as well as in terms of ties); 2). the open nature of functioning; 3). the dynamics of the process of formation; 4). the presence of elements of random choice [stokhastika?] in development.

The task of optimizing the formation of program-special purpose regional production complexes as a whole can be formulated in the following manner: to find the best variant from the point of view of the country's national economy for the structure and process of formation of the complex, while taking into account the possible external situations and internal conditions for the formation and functioning of the complex. The following are revealed as a result of the accomplishment of this task:

- a). the set of objects in the sphere of material production and nonproductive sphere, their scope and time for creation, the siting, external and internal ties and the demand for all kinds of resources and services;
- b). the structure and volumes of demand for physical resources and the trends in their utilization;

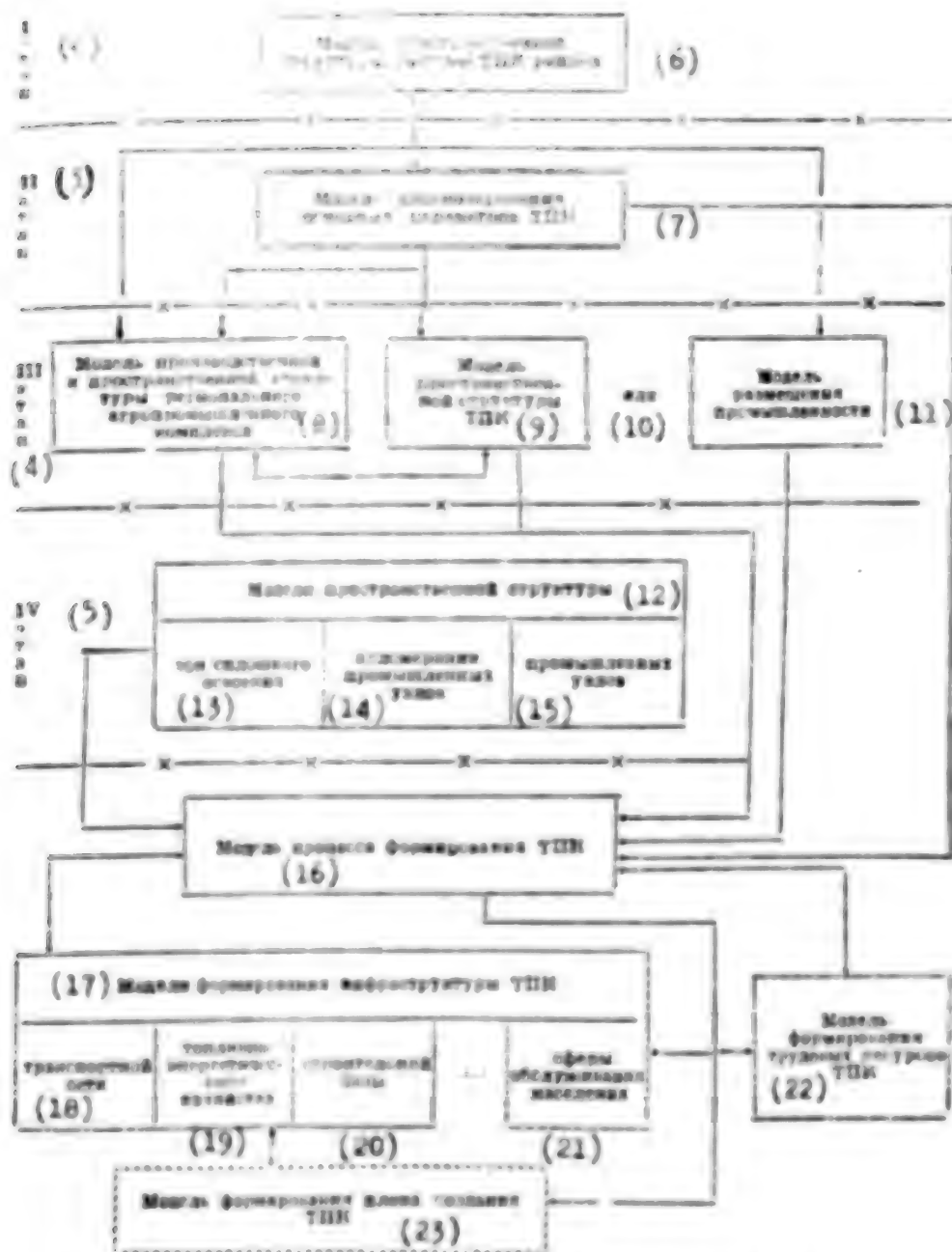
c). the quantity and composition of the manpower resources necessary for all sectors of the economy of the regional production complex, their distribution among the spheres of application of labor, the total number of the population, its distribution and the demand for all kinds of services and resources in conformity with the system obtaining for settlement of people in new locations and with the specific features of the natural conditions and the required living conditions;

d). the sources for obtaining local natural resources, the priority for their development, the distribution of resources among users, the "load" on the environment and the volume of physical resources necessary to provide for the requirements for the protection of the environment and the reproduction of some kinds of resources.

The requirements for full realization of the program for the creation of the material and technical base necessary for the solution of a national economic problem, as well as additional conditions which were laid down by the decision on the creation of the program-special purpose regional production complex in question (living conditions for the populace, protection of the environment, development of the elements in the sphere of physical and non-physical production of inter-complex importance, etc.), appear as mandatory conditions. During the accomplishment of the practical tasks, the content of these conditions is given concrete expression in keeping with the specific features of individual regional production complexes and the duration of the period under consideration.

Research on optimizing the development and siting of the productive forces of regional production complexes has been carried out in the Institute of Economics and in the OPP of the Siberian Department of the USSR Academy of Sciences since the end of 1964. The task of optimizing the development of a regional production complex with sectorial units [11], which was intended for the determination of a production structure for the regional production complex that was efficient both from the position of its external ties as well as from the point of view of the conditions for intracomplex functioning of individual production lines, was the first spatial model. A model for a system of regional production complexes (production cycles for a region) and a dynamic model for an individual regional production complex [12, 13] were proposed later.

It was gradually ascertained that the optimization of the regional production complex with the help of one model is not only very complicated, but also is not necessary, since an attempt is made in conjunction with this at a simultaneous solution of problems from different levels of planning and of calculation of a specific set of factors with a varying degree of differentiation. As a result of research from 1964 to 1968, a concept emerged of a regional production complex as an object for modeling and the first variant in a group of models for the optimization of their formation was proposed [14], the modern version of which (Diagram Two) was most fully described in [7]. The use of a group of models for optimization of the formation of regional production complexes enables one to put into effect the principle of combining extended and



(1) Схема 2. Группа моделей оптимизации формирования ТПИИ

Diagram Two

- Key:
1. Group of models for optimizing the formation of regional production complexes
 2. First stage
 3. Second stage
 4. Third stage
 5. Fourth stage
 6. Model for spatial structure of the system of a regional production complex of the region
 7. Model for the forecasting of the basic parameters of the regional production complex
 8. Model for the production and spatial structure of a regional agro-industrial complex
 9. Model for the spatial structure of a regional production complex
 10. or
 11. Model for the siting of industry
 12. Models for spatial structure
 13. of zones of dense development
 14. of agglomeration of industrial centers
 15. of industrial centers
 16. Model for the process of the formation of the regional production complex
 17. Models for the formation of the infrastructure of the regional production complex
 18. of the transport network
 19. of the fuel and power resources and services
 20. of the construction base
 21. of the sphere of services to the populace
 22. Model for the formation of the manpower resources of the regional production complex
 23. Model for the formation of the plan for creation of the regional production complex

detailed analysis and the gradual transition from the solution of over-all questions to particular solutions with the subsequent generalizations made from them. In working out individual models, the existing system of planning, the place of the regional production complex in the territorial division of labor, specific features of the interrelationships of the elements of its economy, the requirement for utilization only of initial information within easy reach at the present time and the availability of algorithms and programs for the computers were taken into account.

Inasmuch as each regional production complex is a link in the economy of the economic region, its specialization is determined after the place of the region in the all-Union territorial division of labor has been disclosed, after the targets for the development of sectors of specialization have been set and after the limits to the resources that are in short supply which the region can obtain from outside are indicated. Under these conditions, the disclosure of complexes and the determination of their specialization present the task of

formation of the spatial structure for the region. In order to accomplish it, it is necessary to analyze thoroughly the opportunities for siting new objects of the sectors of specialization of the region, of production lines that make up the complex and of the production infrastructure of inter-regional and region-wide importance in the individual portions of its territory, known as areas. In connection with this, it is necessary to taken into account the model for siting which had previously taken shape, the varying extent to which the areas are endowed with natural resources, the existing system of settlement of people in new areas in the region, the extent of development of the infrastructure in the territory and a number of other factors.

These features in the siting of production lines in a region have been reflected in the model for the spatial structure of the system of a regional production complex of an economic region [7, chapter 5]. The criterion for the selection of the optimum solution is the requirement to minimize the total expenditures incurred on the formation and functioning of the economy of the economic region, while taking the living conditions that are being planned for the population into account. As a result of calculations in terms of the model in question, the quotas for the production of output by the sectors of specialization are allocated among the various regional production complexes of the region, as are the limits for the national economic and region-wide resources destined for multi-purpose use; the scope of development and the areas for siting major objects of the production infrastructure of region-wide importance are determined, while an opportunity for research on intra-regional complexes appears.

Inasmuch as the specific character of the formation of the economy of each intra-region regional production complex is not fully disclosed in the aforementioned model, then the resources that were allocated can turn out to be inadequate for the proportional development of all elements of the complex. In order to uncover and eliminate this shortfall, estimates are made in terms of the model for forecasting the basic parameters for the formation of a regional production complex [7, chapter 6]. The influence of the structure and scale of development of the sectors of specialization on the structure and levels of development of production lines that make up the complex is analyzed in it. The requirement to provide the population with the assigned set of goods and services and to create the planning living conditions is reflected, while taking into account a possible change in the quantity of manpower resources. The interrelationships of all elements of the economy of the regional production complex with sectors of the production infrastructure are revealed. In conjunction with this, the status of the economy of the complex as of the beginning of the planning period and the interrelationships in time of production, the infrastructure, the population and resources are taken into account. The requirement to minimize current and capital expenditures necessary for fulfillment of the quota in terms of creation of enterprises in the sectors of specialization under conditions of proportional development of the elements under consideration in the economy of regional production complexes is the criterion for the extent to which the situation is optimum.

The optimization of the spatial structure of each regional production complex of the region is carried out further—the plots for siting new industrial

enterprises, production lines and objects of the infrastructure are determined and the structure of industrial centers, their production and economic aims and the model for settlement of the populace in new areas are discussed. There are two ways which are possible for determining the model for the spatial structure of the complex, depending on the production structure and scope of development of individual regional production complexes.

The first applies to regional production complexes with a complex diversified structure of the economy and with highly-developed industry and agriculture. Estimates are being made in terms of two interrelated models: of the production and spatial structure of a regional agro-industrial complex and of the spatial structure of the regional production complex [7, chapters 7 and 8]. The first presents the interrelationships of sectors of agriculture and the technology of industrial production lines connected with them, production lines that process agricultural raw material, manufacture materials for agriculture or render services to it, i.e., the aggregate of sectors of the regional agro-industrial complex is analyzed. In making estimates in terms of this model, the model for development and siting, according to which the planned demand by the populace of the region for foodstuffs of local production is satisfied, is determined and the quotas for the export of the final product are fulfilled under conditions marked by minimizing the total expenditures incurred on the creation and functioning of all objects of the regional agro-industrial complex.

The model for the spatial structure of the regional production complex reflects the prerequisites for siting new enterprises from the sectors of specialization, production lines that make up the complex and objects of the production and social infrastructure on the territory of the complex, while taking the existing structure of the economy into account. The entire aggregate of interrelationships among the elements of the economy of the regional production complex that have been named is analyzed here along the line of possible utilization of local resources (land, water) of individual sites and of the operation of one and the same objects of the infrastructure (transport network, electric power transmission lines, construction base), while the requirement for fulfillment of the assigned ratios for employment of men and women in industrial centers is taken into consideration. Under the condition that the goal for siting in the regional production complex of the fixed set of enterprises from the sectors of specialization of inter-regional and intra-regional importance and the proportionate development of all interrelated production lines is fulfilled, it is required that the quantity of total expenditures incurred on the creation and functioning of the elements of the economy under consideration be reduced to a minimum.

The second way to optimize the spatial structure of the regional production complex applies to complexes with a narrow specialization of industrial production, with a rather small number of objects, with underdeveloped agriculture or with agriculture oriented in a suburban direction. In such complexes one is required to determine the production structure of the basic industrial centers with the condition that fulfillment of the quota for production of output from the sectors of specialization be a *sine qua non*, while observing the restrictions

and minimizing expenditures incurred on the creation and functioning of all objects under investigation. A special model for siting industry [7, chapter 9] is used for this purpose.

After the optimum variant for the spatial structure of the regional production complex has been found, after the production specialization of the industrial centers has been determined and after the foundations for the model for settling people in new areas are worked out, the task of optimizing the spatial structure of industrial centers is accomplished. Its essence boils down to functional zoning of the territory, to optimization of the development and siting of all intra-center elements of the infrastructure and to a rational allocation of resources. The model for the spatial structure of an industrial center [7, chapter 10] is utilized to accomplish it.

Further on, the dynamics of the process of formation of the economy of the complex is investigated, with consideration given to the model selected for the siting of enterprises, objects of the infrastructure and settlement of the population in new areas. The dynamic model for the process of formation of a regional production complex [7, chapter 11] is applied for this purpose.

As has already been pointed out, in optimizing the regional production complex, great attention is paid to the infrastructure, since the rational siting and efficient use of its objects lead to a considerable saving on national labor. The infrastructure has been presented in all models of the regional production complex with a varying degree of being broken down into details. In order to disclose more fully all the conformances to law in its formation and operation, models are constructed for the formation of the transport network, the fuel and power resources and services, the construction base and the sphere of services to the populace. In connection with this, sectorial models that have already been worked out and are adapted to the specific features of the complex under analysis can be utilized.

Although each of the models being considered was intended for the solution of a definite range of problems, they are all interconnected with each other and in computations made in terms of one of them, data from the others is utilized. The sequence indicated on Diagram Two and the succession of calculations can be refined depending on the content of the concrete problems and the specific conditions of individual regions. Thus, for instance, in performing research on the Angaro-Yeniseyskiy [Angara-Yenisey] region, all the models enumerated are drawn upon, while in research on the Sredne-Ob'skiy [Central Ob'] or Mangyshlakskiy [Mangyshlak] regional production complexes, which are rather clearly outlined in structure and territory, there is no need to utilize the model for the spatial structure of their system.

An analysis of the principles of modeling of the spatial structure of the system of the regional production complexes for the region and of an individual regional production complex has enabled one to formulate a special category of tasks—territorial-production regional mesomodels [15]. In general form, a model of such a type will contain the following groups of conditions:

balances of production and allocation of output of the sectors of specialization or of production lines that make up the complex

$$\sum_{j \in J_1 \cup J_2} \sum_{r \in R_j} (A_{ij}' - B_{ij}') x_{jk}' - \sum_{\varphi \in \Phi} \sum_{r \in R_\varphi} b_{\varphi r}' z_{\varphi k}' - \gamma_k a_k - \sum_{p \in K} (v_{ikp} - v_{ik}) > W_{ik}, \quad i \in I_1, \quad k \in K (< V_{ik}, \quad i \in I_1, \quad k \in K); \quad (1)$$

restrictions on the intensiveness of functioning of enterprises (production)

$$x_{jk}' \leq 1, \quad j \in J_1 \cup J_2, \quad r \in R_j, \quad k \in K; \quad (2)$$

balances of the formation and allocation of services of the infrastructure

$$\sum_{\varphi \in \Phi} \sum_{r \in R_\varphi} (D_{\varphi r} - b_{\varphi r}') z_{\varphi k}' - \sum_{j \in J_1 \cup J_2} \sum_{r \in R_j} B_{\varphi j}' x_{jk}' - \gamma_k a_k - \sum_{p \in K} (v_{\varphi kp} - v_{\varphi p}) > 0, \quad \varphi \in \Phi, \quad r \in R_\varphi, \quad k \in K; \quad (3)$$

restrictions on the reserves of previously created capacities of objects of the infrastructure or on the permissible capacities of new objects

$$z_{\varphi k}' \leq D_{\varphi k}', \quad \varphi \in \Phi, \quad r \in R_\varphi, \quad k \in K; \quad (4)$$

balances for the formation of the demand for manpower resources

$$\sum_{j \in J_1 \cup J_2} \sum_{r \in R_j} I_j' x_{jk}' + \sum_{\varphi \in \Phi} \sum_{r \in R_\varphi} t_{\varphi r}' z_{\varphi k}' + (e_k - 1) l_k = 0, \quad k \in K; \quad (5)$$

balances for the allocation of local resources

$$\sum_{n \in N} y_{nk}' - \sum_{j \in J_1 \cup J_2} \sum_{r \in R_j} B_{nj}' x_{jk}' - \sum_{\varphi \in \Phi} \sum_{r \in R_\varphi} b_{n\varphi}' z_{\varphi k}' - \gamma_k a_k > 0, \quad n \in N, \quad k \in K; \quad (6)$$

restrictions on the extent of utilization of local resources

$$y_{nk}' \leq M_{nk}', \quad n \in N, \quad r \in R_n, \quad k \in K; \quad (7)$$

requirement for minimizing expenditures incurred on the creation and functioning of the elements under consideration in the economy of the regional production complex

$$\sum_{k \in K} \left(\sum_{j \in J_1 \cup J_2} \sum_{r \in R_j} S_{jk} x_{jk}' + \sum_{\varphi \in \Phi} \sum_{r \in R_\varphi} s_{\varphi k}' z_{\varphi k}' + s_k l_k + \sum_{\varphi \in \Phi} \sum_{p \in K} c_{\varphi kp} v_{\varphi kp} + \sum_{i \in I_1 \cup I_2} \sum_{p \in K} c_{ikp} v_{ikp} + \sum_{n \in N} \sum_{r \in R_n} s_{nk}' y_{nk}' \right) \rightarrow \min. \quad (8)$$

j represents the index of production or the enterprise, $j \in J$, where J represents a large number of enterprises from the sector of specialization (being modernized, currently functioning and new), l represents the number of production lines that make up the complex (being modernized and new), i represents the index of the product, $i \in I$, or $i \in I_1$, where I_1 represents the output of the sectors of specialization, l_1 represents the output of the production lines that make up the complex, n represents a kind of local resource, $n \in N$, where N represents a large number of kinds of local resources under consideration, r represents the index of the variant, $r \in R$, $r \in R_1$, $r \in R_2$, where R_1 represents a large number of variants in the functioning of production, R_2 represents a large number of variants in the functioning of the infrastructure, φ , $\varphi \in \Phi$, φ represents a large number of variants (categories) of the resource n , k, p represent indexes of the areas or sites for the location of enterprises, production lines, objects of the infrastructure or deposits of resources, $k, p \in K$, where K represents a large number of areas or sites under consideration on the territory of the region or regional production complex, $z_{\varphi k}^r$ represents the intensiveness of functioning of the enterprise (production) j in terms of the variant r in the area or on the site k , $z_{\varphi k}^r$ represents the intensiveness of functioning of an object of the infrastructure φ in terms of the variant r in the area k , v_{ikp}^r or $v_{\varphi kp}^r$ represent shipments of the product i or services φ from area k to area p ; $v_{\varphi kp}^r$ or $v_{\varphi kp}^r$ represent shipments of product i or services φ from area p to area k ; l_k represents the number of those employed in the production lines under consideration in area k ; A_{ij}^r represents the volume of production of the product i in terms of the variant r at enterprise j ; $\delta_{\varphi\varphi'}$ represents the element of the unit matrix (symbol of δ Kronecker); $\delta_{\varphi\varphi'}$ is equal to a unit when $\varphi = \varphi'$ or zero when $\varphi \neq \varphi'$; B_{ij}^r , $B_{\varphi j}^r$, B_{nj}^r represent the volume of utilization of the product i , of services of infrastructure φ , of resource n at enterprise j in terms of the variant r ; $b_{i\varphi}^r$, $b_{\varphi\varphi'}^r$, $b_{\varphi n}^r$ represent outlays of product i , of services of infrastructure φ' or resource n on a unit of services of infrastructure φ in terms of variant r ; T_j^r represents the number of those employed at enterprise j in terms of variant r ; t_{φ}^r represents labor input on a unit of services from infrastructure φ in terms of variant r ; γ_i , γ_{φ} , γ_n represent the norm for consumption by the populace of product i , of services of infrastructure φ or resource n ; α represents the coefficient of family ties ϵ_k represents the portion of those employed in the sphere of social services out of the total number of those employed in area k ; W_k represents the quota for export of product i of the sector of specialization beyond the borders of the region (or regional production complex) through border [prigranichnyy] area (or site) k ; V_k represents the limit on the amount of product i through border area k for intra-region consumption, $D_{\varphi k}^r$ represents the reserve of capacity of a previously created object of infrastructure φ in area k or the permissible capacity for the functioning of a new object in terms of variant r ; M_{nk}^r represents the availability of resource n of category r in area k ; f_{jk}^r represents expenditures incurred on the creation and functional of enterprise (production) j in terms of variant r in area k ; $g_{\varphi k}^r$ represents proportionate expenditures incurred on the creation and functioning of infrastructure φ in terms of variant r in area k ; a_k represents the norm for expenditures incurred on building up facilities throughout the region to accommodate the needs of the population [obustroystvo naseleniya]

in area q ; $c_{k,p}^r$ represents proportionate expenditures incurred on the utilization and reproduction of resource n of category r in area k ; $c_{k,p}^l$, $c_{k,p}^s$ represent proportionate expenditures on the transporting of product l or services of infrastructure p from area k to area p .

The most important feature of the suggested approach to territorial-production regional mesomodels is the joint analysis of the conditions for the creation and functioning of sectors of specialization and production lines that make up the complex (x_j^r) , of the infrastructure (z_p^r) , of the terms for utilization of manpower (l_k) and local resources (y_n^r) , as well as for the building up of the region to accommodate the needs of the populace. Each of the elements named in the economy of the regional production complex has its own range of problems to solve: in the sectors of specialization, the areas or sites for locating new enterprises, the variants for modernization of currently functioning enterprises, the intensiveness of their functioning and the directions in transport and technological ties are disclosed, while for the production lines that make up the complex, the total volumes of production of output, the capacities and siting of individual objects, and for the infrastructure, rational trends for the utilization of the reserves in the capacities of previously created objects, as well as capacities of and points for siting new objects, are disclosed. The population is viewed both from the position of providing all the production lines with manpower resources, as well as from the position of creating objects for the social and personal services infrastructure for the building up of the region to accommodate the needs of the population according to the planning norms that have been adopted for the future. While taking the development of currently functioning objects into account, local resources are rationally allocated among production, the infrastructure and the populace. In conjunction with this, particular attention is being paid to the disclosure and elimination of any negative influence on the condition of the environment.

Each agenda item is resolved in an over-all manner, with account taken of the multilateral relationships of all elements of the economy of the region or regional production complex. This requirement has been reflected in the model through balances for production and the allocation of output and services of the infrastructure and for the utilization of manpower and local resources. The aforementioned feature distinguishes territorial regional production mesomodels from sectorial and diversified models for the development and siting of production and makes it closer in form to the regional intersectorial balances. However, an analysis is being made of intersectorial production and territorial ties in the territorial regional production mesomodel, while taking into account the spatial dissociation of the objects being researched and the limitations on the potentials for the functioning of production lines and utilization of resources.

Besides the features common to the spatial models considered above, there exist differences springing from the specific nature of the tasks being accomplished with their assistance and the place which they occupy in the system of models for long-range regional production planning being drafted in the Institute of Economics and the OPP of the Siberian Department of the USSR Academy of Sciences. The production intersectorial interrelationships, i.e. conditions (1),

are presented most fully in the model for the spatial structure of the system for the regional production complex of an economic region [7, chapters 1, 2]. With the help of this model, the regional production complexes are analyzed and their specialization is determined; hence, the entire aggregate of production-transport interrelationships of the sectors of specialization and of production firms that make up the complex is subject to painstaking analysis upon the definition of the capacity, technology and area for siting of production lines. The structure of the block of conditions in question remains one of the components of multi-stage production-transport models of sectors, consisting of the procedures for the extraction of raw material, primary dressing, delivery to centers for processing and so forth, right up to shipments beyond the borders of the region. With instructions given as to the route and point of export at the border, are investigated in an analogous manner.

The block of production conditions is sufficiently simple [7, chapters 1, 10] in the models for the spatial structure of individual regional production complexes and industrial centers, and in some instances only the requirements for mandatory siting of the assigned collection of enterprises [16, chapters 2 and 3] is present in it, taking the form

$$\sum_{i \in K} \sum_{j \in H_i} x_{ij} = 1, \quad j \in J_1 \cup J_2. \quad (9)$$

this is explained by the fact that at the level of research in question, other tasks are already being accomplished, tasks in which great attention has been paid to the infrastructure, the population and local resources.

The block of the infrastructure—conditions (3) and (4)—is also marked by a varying degree of breaking down the description of objects into detail depending on the sector of the infrastructure and the hierarchical level of the territory under consideration. In the model for the spatial structure of the system of a regional production complex of an economic region, the conditions for the creation and operation of the transport and power systems of the region and of the construction bases have been more fully presented. In the models for the spatial structure of individual regional production complexes and industrial centers, these sectors of the infrastructure are viewed with less completeness, which is explained by the extent of the territories being investigated. The power network is portrayed here by distribution lines of lesser capacity, which, in the majority of cases, already possess fixed sources of electric power supply, both in terms of power, as well as in terms of their siting. The transport system is analyzed selectively—only along the stretches that are most loaded with traffic and along new stretches.

When there are fixed directions and volumes of shipments among enterprises from the sectors of specialization, it has turned out to be possible to use a simplified method to reflect transport ties in models for the spatial structure of regional production complexes, which enables one to reduce considerably the dimension of the tasks being accomplished. However, in models of this type, the conditions for the creation and operation of objects of the infrastructure with immobile services (heat and electric power stations, housing, objects of the social and everyday services infrastructure, etc.), on the contrary, are

represented in more detail. They are taken into account only through expenditures on their creation. Thus, in the functional, in the model for the spatial structure of the system of the regional production complex of an economic region.

The block of manpower resources and population-conditions (5)--is marked by a distinctive special feature. Balances for the formation of the demand for manpower resources are present in all models, while with their help the increment in the number of population in the areas being researched and the resources necessary for building it up with facilities to accommodate the needs of the populace are taken into account. In addition, with the assistance of the conditions of the block in question, it is possible to solve yet a number of other important problems. As was illustrated in [7, chapter 14], with the use of the model for the system of a regional production complex of an economic region, it is possible to implement the choice between labor-intensive and capital-intensive processing methods, if one supplements the block of manpower resources with a limitation on the increase in the number of people employed in the production lines under consideration. Restrictions on the volume of local manpower resources permit one to take into account the requirement for a more complete utilization of the reserves of previously created housing and objects of the social and everyday services infrastructure [7, chapter 15; 16, chapter 4]. In addition to this, the conditions of the block in question enable one to analyze social problems. For instance, by taking into account men and women separately in the balance of manpower resources, it is possible to retain the assigned proportions for their employment in individual areas or industrial centers [7, chapters 7 and 10].

Also, the conditions for utilization of natural resources, including land and water ((6) and (7)) are studied in a differentiated manner in the models for regional production complexes. As practical calculations made in terms of the model for the spatial structure of the system of a regional production complex of an economic region have shown, in Siberia the resources of land and water of individual areas are often not limiting factors in the selection of variants for the siting of production, i.e., in the selection of the specialization for individual regional production complexes. In the model for a system of a regional production complex, the qualitative condition of the aforementioned resources and the atmospheric basin is taken into account in more detail with the aim of catching hold of traces of the negative consequences of excessive regional concentration of production. However, in the selection of individual sites for locating enterprises and objects of the production and social infrastructure, i.e., in calculations in terms of the model for the spatial structure of the regional production complex, the role of quantitative restrictions on land and water will grow, since the conditions for the creation of suburban agricultural zones and of recreation zones for the populace are being taken into account.

A block of clauses for utilization, protection and reproduction of natural resources is being introduced in case of the need for a more detailed accounting for the environment.

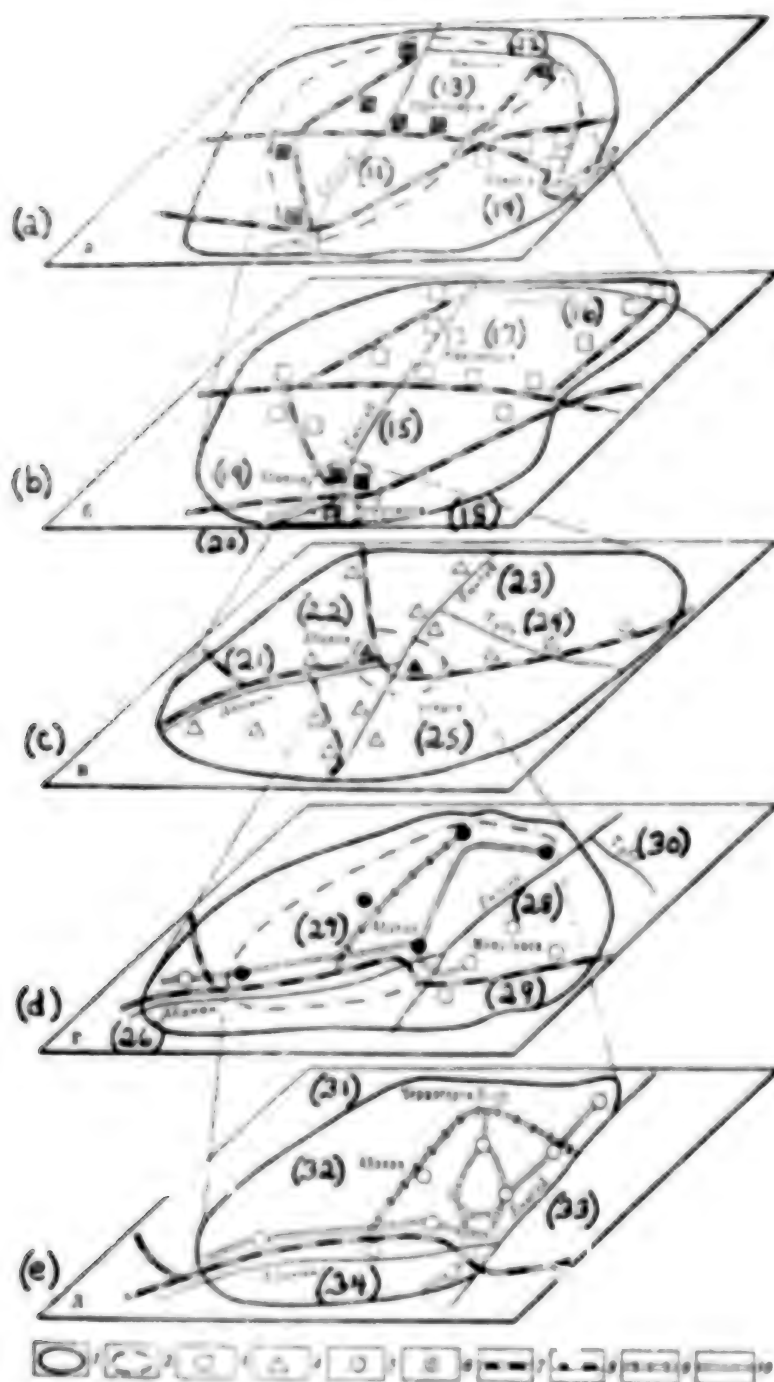
The requirement to minimize the sum of expenditures incurred in the construction and functioning of the objects being studied in the framework of the formation of a regional production complex or industrial center--condition (1)---has been adopted as a criterion for optimum performance in spatial models. The economic composition of the criterion in question changes from level to level in conformity with the economic organization of tasks and with the structure of the models. As a result, the economic composition of valuations in the models changes [7, chapter 14]. For instance, in the model for the spatial structure of the system of the regional production complex of the economic region, the expression of the expression (1) has the character of total proportionate expenditures on the production of output in the region of the kind under consideration. In the model for the spatial structure of an individual regional production complex, the formulas (1) - (2) replace (9). In conformity with this, the valuations are not of units of products, but valuations of enterprises, which are the magnitude and structure of the total expenditures on the creation of the enterprises in question in the regional production complex. With their assistance it is possible to disclose the shares of the sectors in overall expenditures on the creation of the infrastructure and the development of resources in the regional production complex and to obtain other information for an analysis of the solution.

However, the criterion for a minimum of expenditures incurred is not the only one. There is the experience of the estimates made in terms of the average-daily [Middle Ob'] regional Production Complex, which envisage expenditures of time by the populace on conveyance to work and on trips for cultural and personal services purposes that are connected with the servicing of objects of intervillage significance [7, chapter 11].

A practical audit was made of a group of models for optimizing the formation of regional production complexes on the basis of materials relating to the Anzaro-Yeniseyskiy [Anzara-Yenisey] (see drawing) and Sredne-Obskiy regional production complexes. At the present time, research is being carried out on the Yuzno-Yakutskiy [Southern Yakutiya] Regional Production Complex [16, 17 and others]. The results of the accomplishment of a number of tasks have been laid down as the foundation for the respective diagrams for regional lay-outs, which were adopted by the RSFSR State Committee for Construction Affairs and approved by local administrative organs. The models being suggested have been recommended to the institutes of the RSFSR State Committee for Construction Affairs for use as an instrument in the analysis of spatial structures.

At the present time practical calculations are being made in terms of models for optimizing the spatial structure of the system of the regional production complex of the economic region and of an individual complex, while taking the time factor into account [17, 18].

In keeping with the comprehensive approach to the study of regional production complexes, natural resources and the environment are one of the basic objects of research. However, previously, elements of the natural surroundings were viewed chiefly from the point of view of the efficiency of their utilization.



Разукрупнение территориальных тапномических единиц при решении задач по Азово-Черноморскому региону: а - регион; б - Краснодарский край; в - Салский район; г - Абхазо-Мтсхетская агломерация; д - Абхазо-Черноморский промышленный узел; е - границы и подразделения территории; 1 - границы территории, исследуемой в последствии и начале; 2 - ареал; 3 - площадь; 4 - участок; 5 - микроареал; 7 - 10 - транспортные магистрали [7]

Direction: breaking regional taxonomic units up into smaller parts in the accomplishment of tasks in terms of the Angaro-Yeniseyskiy region.

- | | |
|---|------------------|
| Key: a). [Angaro-Yeniseyskiy] Region | 16). Angara |
| b). Krasnoyarskiy Kray | 17). Krasnoyarsk |
| c). Sayanskiy Complex | 18). Chirchik |
| d). Abakano-Minusinskaya Agglomeration | 19). Abakan |
| e). Abakano-Chernogorskiy Industrial Center | 20). Abakan |
| 1). Borders of the territory under investigation | 21). Abakan |
| 2). Borders of the territory being researched in the following task | 22). Abakan |
| 3). Area | 23). Yenisey |
| 4). Site | 24). Tuba |
| 5). Section | 25). Minusinsk |
| 6). Microregion | 26). Abakan |
| 7-10). Main transport lines [1] | 27). Abakan |
| 11). Yenisey | 28). Yenisey |
| 12). Angara | 29). Minusinsk |
| 13). Krasnoyarsk | 30). Tuba |
| 14). Irkutsk | 31). Chernogorsk |
| 15). Yenisey | 32). Abakan |
| | 33). Yenisey |
| | 34). Abakan |

In recent years, a much broader analysis of the interrelationships of the economy of the region with the environment has been carried out. There is experience in making calculations in terms of models that take into account the opportunities for protection and reproduction of natural resources [17].

As is also the case with regional models, the question of obtaining integer-value variants for the siting of enterprises and accounting for the non-linear character of change in expenditures on the creation of industrial objects and the infrastructure remains critical. Working models of regional production complexes are linear with mixed variable models. Calculations made in terms of them are carried out with the use of algorithms and programs that realize the over-all task of linear programming. In order to eliminate the aforementioned defects, it is necessary to take recourse to labor-intensive variant calculations with a continuous adjustment of individual data [16, 18]. An attempt has been made to work out a quantified model for a regional production complex and a special program for its realization; however, they have still not succeeded in reflecting and implementing a joint analysis of all the necessary prerequisites for the formation and functioning of all interrelated elements of the economy [20].

Models for a regional production complex can be utilized both in self-contained, as well as in automated systems of planning estimates. The solution to the problems of including a group of models for optimizing the formation of a regional production complex in an automated system of planning estimates has been conditioned by the informational interrelationships of this group with other links in the system of models for the national economy being drafted in

the Institute of Economics and the OPP of the Siberian Department of the USSR Academy of Sciences. At the present time, research is being carried out on the coordination of the spatial models of the region, of the regional production complex and industrial center on the basis of the method of iterative aggregating [iterativnoye agregirovaniye] [18].

An expansion of the sphere of practical application of the models under consideration is, unfortunately, being carried out considerably more slowly. Pre-planning research on regional production complexes with the help of mathematical models and computers is being carried out in an incidental manner. To get it smoothly under way at a steady tempo, it is necessary to carry out substantial work in planning organs on the output of methods for the use of models for regional production complexes. The first steps in this direction are methods tenets [6] and research on the analysis of the adaptive properties of regional production systems [21] and on the extended analysis of the results of optimizing the spatial structure of regional production complexes [18].

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